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LIHNELL (D.). **Schizophyllum commune som trädparasit i vårt land.** [*Schizophyllum commune* as a tree parasite in our country.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1941*, 1, pp. 11–12, 1941.

Attention is drawn to the occurrence of *Schizophyllum commune* as a parasite of living trees in Sweden; it was previously little known in the country and then only as a saprophyte on winter-killed wood. At the end of 1940, however, O. Andersson, of the Lund Botanical Museum, made two collections of the fungus, one on living apple and plum trees and the other on ash.

PIRONE (P. P.). **Chlorosis of Pin Oaks and its control.**—*Shade Tree, N.J.*, xiii, 12, pp. 1–4, 1940. [Abs. in *Chem. Abstr.*, xxxv, 9, p. 2930, 1941.]

Pin oaks [*Quercus palustris*] growing in an area that had been filled in with ashes and other waste developed acute chlorosis and stunting. A marked improvement in the state of the trees was obtained by the insertion of 1 to 4 capsules (according to the diameter of the tree) containing 5 gm. ferric phosphate into holes bored obliquely downwards to a depth of about 2 in. and equally spaced round the trunk, grafting wax being used to seal them. Leaf colour and twig growth were also ameliorated by punching holes in the soil round the root zone of the tree and introducing a 2 : 1 : 1 mixture of ferrous sulphate, sulphur, and aluminium sulphate at the rate of 3 to 5 lb. per tree.

ISRAILSKI (V. P.) & ARTEMIEVA (Mme Z. S.). **Biological properties of the agent (Bacterium mori) of Mulberry-tree bacteriosis.**—*Микробиол.* [*Microbiol.*], viii, pp. 888–898, 1939. [Russian, with English summary. Abs. in *Chem. Abstr.*, xxxv, 11, p. 3673, 1941.]

The lytic action of the bacteriophage of *Bacterium* [*Pseudomonas*] *mori*, the agent of mulberry bacteriosis in the U.S.S.R. [*R.A.M.*, xvi, p. 785], is stated to be non-specific. The bacteriophage exerts a prophylactic effect against mulberry leaf infection by *P. mori* and falls into two groups of strains, acid and alkaline, of which only the former ferment glucose and sucrose. The serological method of diagnosis of infection [ibid., xix, p. 73] in the host gives the most accurate results.

An emulsion of a pure culture of the bacteriophage of *P. mori* or the pulp of diseased mulberry leaves, introduced into garden soil, will lose its activity in about six days.

Starygina (Mme L. P.), Goldin (M. I.), Lyagina (Mme N. M.), & Tryasunova (Mme T. I.). **Mulberry bacteriosis.**—*Микробиол.* [*Microbiol.*], ix, pp. 282–294, 1940. [Russian, with English summary. Abs. in *Chem. Abstr.*, xxxv, 11, p. 3681, 1941.]

The various strains of *Bacterium* [*Pseudomonas*] *mori* isolated from samples of mulberry leaves from the Ukraine, Crimea, and other regions of the U.S.S.R. [see preceding abstract] were found to be identical in their morphology, physiology, and agglutinative action, and to correspond with the description of the organism given by [E. F.] Smith (*Science*, N.S., xxxi, p. 792, 1910). Cultures of *P. mori* remain stable and retain their virulence at a temperature range of 0° to 30° C. for a lengthy period, which is curtailed by warmer conditions or desiccation. Infection is not seed-borne, but may overwinter in diseased foliage in the soil and spread during the next growing season.

Weiss (F.) & Baumhofer (L. G.). **Culture, diseases, and pests of the Box Tree.**—*Fmrs' Bull. U.S. Dep. Agric.* 1855, 18 pp., 9 figs., 1 map, 1940.

In this popular leaflet on the cultivation of boxwood (*Buxus sempervirens*) in the United States, it is stated that debility and dying-off of the shrub have been prevalent since the drought years of 1930 and 1931 and the exceptionally cold winters of 1934 and 1935. The symptoms include change in the colour of the foliage to yellowish- or greyish-green, weak growth and premature dropping of old leaves, death of entire branches, and the formation of sunken areas in the bark of the trunk. Primary causes of the condition are thought to be cultural or climatic (notably winter injury), but *Macrophoma candollei* [*R.A.M.*, xiii, p. 737] associated with leaf cast and *Volutella* [*Chaetodochium*] *buxi* [loc. cit.] with twig blight develop on weak or injured plant parts. The latter fungus and *Verticillium buxi* [loc. cit.] are characteristically associated with wilt or canker, which are possibly aspects of the same disease, but the significance of these agents as primary parasites is not fully established. As a measure of control, it is recommended to prune out thoroughly the affected branches as low down as the disease can be traced and to excise bark cankers completely, taking care to coat the exposed areas with shellac.

Disease of Silver Fir in underplanting.—*Gdnrs' Chron.*, Ser. 3, cix, 2843, p. 236, 1941.

It is reported that silver fir (*Abies alba*) trees [in Britain] have been recently attacked by a disease caused by *Trichosphaeria parasitica* [*Acanthostigma parasiticum*]. It is suggested that the disease is due to planting the trees under too intense shelter where the soil is moist. Diseased trees are very restricted in growth and young shoots wither and become bleached in appearance, while the terminal shoot generally remains unaffected. Young trees are found, however, to recover quite satisfactorily, recuperation being accelerated by opening up the wood

to admit more light and air. Any kind of silver fir is liable to attack by the fungus and hemlock (*Tsuga*) is also known to be susceptible.

HARRIS (T. H.). **The sampling of Ribes populations in blister rust control work.**—*J. For.*, xxxix, 3, pp. 316–323, 1 map, 1941.

An accurate knowledge of the number of currant and gooseberry bushes and their distribution in forest areas is a pre-requisite condition of *Ribes* eradication, and thus constitutes an important factor in the blister rust [*Cronartium ribicola*] control campaign in the sugar pine [*Pinus lambertiana*] stands of California and southern Oregon. Such information is gained by the systematic sampling, known as 'checking', of control areas by a statistical method which is described in detail. The method has yielded satisfactory results, the detailed maps depicting *Ribes* populations, forest types, and topographical features being of sufficient accuracy to form the basis for intelligent planning and effective performance of the work of eradication.

HAIG (I. T.), DAVIS (K. P.), & WEIDMAN (R. H.). **Natural regeneration in the Western White Pine type.**—*Tech. Bull. U.S. Dep. Agric.* 767, 98 pp., 12 pl., 1 graph, 9 maps, 1941.

Forest tree diseases are stated to create some of the most difficult and troublesome problems in the management of trees of the western white pine (*Pinus monticola*) type in northern Idaho and the contiguous portions of Washington, Montana, and British Columbia. Foremost among these is white pine blister rust (*Cronartium ribicola*), an account of the progress of the eradication campaign against which to date is given [see preceding abstract]. The most prevalent and familiar of the other diseases of *P. monticola* and its ecological associates are the heartwood rots, the order of importance of which was found closely to approximate to Weir and Hubert's ranking (*J. For.*, xvii, pp. 666–681, 1919), viz., *Fomes pini*, *Polyporus schweinitzii*, *F. annosus*, and *Armillaria mellea* on western white pine itself; *F. pini*, *F. officinalis*, and *P. schweinitzii* on western larch (*Larix occidentalis*); *P. schweinitzii*, *F. pini*, *A. mellea*, and *P. sulphureus* on Douglas fir (*Pseudotsuga taxifolia*); *Echinodontium tinctorium* [*R.A.M.*, xiv, p. 205] and *F. annosus* on grand fir (*Abies grandis*) and western hemlock (*Tsuga heterophylla*); and *Poria weirii* [ibid., xi, pp. 140, 615] and *F. pini* on western red cedar (*Thuja plicata*). A study by I. V. Anderson of the incidence of cull due to rotting (*Appl. For. Note, nrth Rocky Mtn For. Range Exp. Sta.*, 63, 1934) in *Pinus monticola* of eight age groups from 81 to 301 years and onwards showed a steady rise from 3 per cent. in the first to 24 per cent. in the last, the weighted average for the series being 15 per cent. Weir and Hubert (*Bull. U.S. Dep. Agric.* 799, 24 pp., 1919) found red ring rot (*F. pini*) in nearly all trees over 200 years old in the Coeur d'Alene and Kaniksu forests, the fruiting bodies frequently appearing only on trees 120 years old or more. From the silvicultural standpoint the most important conclusion to be drawn from these studies is that rot in standing *P. monticola* can be largely avoided by cutting at or below 120 years. In *Tsuga heterophylla* infection by *E. tinctorium* may develop at a comparatively early stage in the life of the tree, Hubert (*Rep. U.S. Dep. Agric. For. Serv., 1929*,

unpublished) detected 46, 94, and 100 per cent. in the 41 to 80, 121 to 160, and over 200 age groups, respectively. *A. grandis* suffers nearly as heavily as *T. heterophylla* from rot due to this fungus. *Thuja plicata*, *L. occidentalis*, and Douglas fir are relatively free from decay except at an advanced age.

McKenzie (H. L.). **Injury by Sugar Pine Matsucoccus scale resembles that of blister rust.**—*J. For.*, xxxix, 5, pp. 487–488, 1941.

Attention is drawn to the strong resemblance between the injuries inflicted on sugar pines (*Pinus lambertiana*) in California, Oregon, Montana, and Wyoming by the scale insect *Matsucoccus paucicicatrices* and incipient blister rust [*Cronartium ribicola*] cankers, introducing a serious complication into the campaign for the eradication of the latter. W. W. Wagener, of the Division of Forest Pathology, Bureau of Plant Industry, points out that microscopic examination of the bark tissues is necessary for the reliable differentiation of the two forms of injury.

Offord (H. R.). **The function of tannin in host-parasite relationships, with special reference to Ribes and Cronartium ribicola.**—[*Bull.*] *U.S. Bur. Ent.* E 518, 27 pp., 1940. [Abs. in *Exp. Sta. Rec.*, lxxxiv, 5, pp. 638–639, 1941.]

In connexion with an intensive study on the chemical properties, function in plants, and influence of tannin on host-parasite relationships, with special reference to *Ribes* and white pine blister rust (*Cronartium ribicola*), the seasonal tannin content was determined for the leaves, current-season and old stems, and roots of *R. petiolare*, *R. inerme*, *R. viscosissimum*, *R. lacustre*, *R. nevadense*, and *R. roezli* [*R.A.M.*, xix, p. 628]. In general, there was an increase up to the middle of the growing season, the maximum tannin content occurring in the leaves and the minimum in the old stems. The quantity of tannin could not in itself be used as the sole index of the reaction of the *R.* spp. to *C. ribicola*. An analysis of the decomposition products of the tannin mass of *R. petiolare* and *R. inerme* (highly and moderately susceptible, respectively) revealed in the latter a higher content of catechol tannins, which probably exerted a stronger specifically toxic action on the rust than the tannins of the former species, which were predominantly of the gallotannin type. Differences were further detected in the ratio of alcohol to water-soluble tannins between *R. petiolare* and the less susceptible *R. inerme*, *R. lacustre*, and *R. viscosissimum*. In the leaves of *R. petiolare*, *R. inerme*, and *R. lacustre* the tannins were concentrated in the epidermal layers and round the vascular bundles. A bibliography of 59 titles is appended.

Bagchee (K.). **Contributions to our knowledge of the morphology, cytology and biology of Indian coniferous rusts. Part I. Cronartium himalayense Bagchee and Peridermium orientale Cooke on Pinus longifolia Roxb.**—*Indian For. Rec.*, N.S., Bot., i, 7, pp. 247–266, 1941.

Pinus longifolia inoculated at the Forest Research Institute, Dehra Dun, with teleutospores of *Cronartium himalayense* [*R.A.M.*, ix, p. 146] developed the *Peridermium* stage. The maximum production of

aecidiospores, with which the death of the trees mostly coincides, takes place during the third and fourth springs following infection of the twigs through mature needles, and the fourth and fifth springs following infection of juvenile needles on thicker stems.

P. orientale Cke on *Pinus longifolia* is shown to be a stage of *Coleosporium campanulae* on *Campanula colorata* [ibid., xvii, p. 278], the form of the rust on *C. canescens* being a distinct physiologic race incapable of infecting *P. longifolia*.

Three appendices furnish a synopsis of the coniferous rusts of India and their hosts, *Peridermium indicum* being listed as a stage of *Cronartium ribicola* on *Pinus excelsa* [ibid., xvi, p. 146].

SCHEFFER (T. C.). **Drying rates of blue-stained and bright lumber.**—*Sth. Lumberm.*, clxii, 2039, pp. 46–48, 1941.

From controlled drying experiments under uniform conditions, using short sections of 1 in. by 6 in. unseasoned lumber of loblolly pine [*Pinus taeda*] and sweet gum [*Liquidambar styraciflua*], it was concluded that blue stain does not retard drying but in various degrees promotes it. Equilibrium moisture contents of stained and bright wood were practically the same. Occasional reports that shipments of lumber with a substantial amount of stain tend to be heavier than similar lots containing bright material are believed to have been based on observations of stock that had not been comparably seasoned.

WILLIAMS (P. H.). **Important diseases of glasshouse plants.**—*Fruit-grower*, xci, 2372, pp. 465–467, 1941.

Some useful information is presented in a semi-popular form on the principal diseases of the three chief food crops cultivated in glasshouses, viz., tomatoes, lettuces, and cucumbers, and their control by sanitary measures and fungicidal treatments. The tomato diseases discussed are damping-off and foot rot (*Phytophthora cryptogea* and *P. parasitica*), sleepy disease (*Verticillium albo-atrum*), root rot (largely due to the unfavourable effects of cold, heavy soils and preventable to a great extent by the insertion of straw in walls, allowing water and air to penetrate to the lower soil layers); leaf mould (*Cladosporium fulvum*), a promising variety resistant to which, named Vetomold, has recently been imported from Canada (further information obtainable from the Director of the Cheshunt Research Station); late blight (*P. infestans*), against which spraying with bouisol is recommended; grey mould of the stems and watery rot and water spot of the fruits (*Botrytis cinerea*); buck-eye fruit rot (*P. parasitica*); blossom-end rot; the ripening anomalies known as 'blotchy ripening' and 'greenback' [*R.A.M.*, xv, p. 690]; and the viruses of mosaic, streak, and spotted wilt, the last-named most troublesome in mixed nurseries.

B. cinerea is the chief parasite of lettuce, to which downy mildew (*Bremia lactucae*) is also sometimes very destructive. Raising the temperature for one night to 60° F. after watering has been found beneficial at Cheshunt against both these fungi.

Cucumbers are liable to infection by *V. albo-atrum*, root rots due to *Fusarium* spp., mildew (*Erysiphe cichoracearum*), and virus diseases, an important remedy against which consists in the exclusive use of

clean seed. At Cheshunt this precaution has eliminated mosaic from the main experimental houses for some years, notwithstanding the proximity of large numbers of diseased plants.

CROXALL (H. E.) & OGILVIE (L.). **The effect of seed dressings containing growth-promoting substances on Lettuce, Tomato, Sugar Beet, and Dwarf Bean.**—*Rep. agric. hort. Res. Sta. Bristol, 1940*, pp. 29–34, [1941].

Experiments are described in which the seeds of lettuces, tomatoes, sugar beets, and dwarf beans [*Phaseolus vulgaris*] were treated with dressings consisting of α-naphthalene-acetic acid or a preparation of mixed naphthylidene-acetic acids [*R.A.M.*, xx, p. 106] incorporated, at concentrations ranging from 1 to 100,000 p.p.m. by weight of the hormone, in talc, cuprous oxide, and zinc oxide. In one test, lettuce seeds treated with cuprous oxide without hormone gave lettuces significantly less in weight than those from untreated seeds, while the lettuces grown from seeds treated with cuprous oxide plus α-naphthalene-acetic acid did not show this reduction. Apart from this one result, under the experimental conditions, the hormones exercised no influence on crop weight.

WALLACE (T.). **A note on manganese deficiency in agricultural and horticultural crops.**—*Rep. agric. hort. Res. Sta. Bristol, 1940*, pp. 19–23, [1941].

The more notable cases of manganese deficiency of crops occurring in England have been found in Romney Marsh, the Fens (including parts of Cambridgeshire and Lincolnshire), the West Midlands, including Warwickshire, Staffordshire, and Shropshire, and in Lancashire, Derbyshire, Somerset, and Bristol. Investigations have demonstrated that manganese as an element is not deficient in the soils concerned in any absolute sense, but that it is unavailable to plants because of conditions in the soils which may have developed naturally or may have been brought about by farming practices. Two factors common to soils associated with manganese deficiency are high organic matter and high lime (P_H over 6·5).

In the Bristol district the most susceptible horticultural crop appears to be Globe beetroot, the long varieties being much less susceptible. Spinach and spinach beet are highly susceptible. Other vegetables affected are parsnip, parsley, Cos lettuce, onion, dwarf and runner beans [*Phaseolus vulgaris* and *P. coccineus*], and vegetable marrow. Among fruits, apples and raspberries have shown interveinal chlorosis of the leaves, the leaves of fruited raspberry canes being more severely affected than the young new seasonal growths. In all crops much natural recovery may occur among plants surviving the early stages of growth.

In the Bristol area failures of agricultural crops have been wholly confined to areas of newly ploughed-out old grassland. All but one of the failures in horticultural crops were brought about by the use of heavy dressings of poor-quality town stable manure and excessive liming.

For purposes of control highly susceptible crops should not be grown.

Good-quality farmyard manure will eradicate the trouble during the year of application only. Application of finely ground sulphur (5 cwt. to 1 ton per acre) has given excellent results. Manganese sulphate has also given a high level of control, used as a fertilizer at sowing time at the rate of 1 cwt. per acre, or applied as a spray or dust to the foliage of the young plants at rates ranging from 20 to 60 lb. per acre. In one instance, the condition was controlled on sugar beet after two sprayings each at the rate of 2·5 lb. of manganese sulphate per acre. The residual effects of this material for later crops appear, however, to be negligible, and a fresh application becomes necessary for each crop.

WALLACE (T.). **Magnesium deficiency of fruit and vegetable crops.**—*Rep. agric. hort. Res. Sta. Bristol, 1940*, pp. 24–28, [1941].

A marked case of magnesium deficiency of vegetables was recorded in 1940 at Long Ashton [cf. *R.A.M.*, xx, p. 68] on land that had previously grown excellent crops. Cauliflowers, broccoli, Brussels sprouts, and early savoys grew well at first, but after 7·92 in. of rain in July, the leaves of the entire crop of cauliflowers developed a yellow and white mottle and diffused red and purple tints [ibid., xix, p. 687]. The broccoli was also affected, though less conspicuously, and the Brussels sprouts showed some discoloration, with well-marked patches of poor growth. Only a few leaves among the savoys showed any mottling. Further investigations are in progress.

OLSSON (P. A.). **Klumprotsjuka (Plasmodiophora brassicae Wor.) på Rovor och Kålrötter samt åtgärder mot densamma, speciellt ur växtförädlingssynpunkt. II. Fortsatta undersökningar samt försök med resistensförädling.** [Club root disease (*Plasmodiophora brassicae* Wor.) on Turnips and Swedes, together with precautions against the same, especially from a plant-breeding standpoint. II. Continued investigations and experiments in breeding for resistance.]—*Sverig. Utsädesfören. Tidskr.*, l, 6, pp. 287–360, 15 figs., 1940. [English summary.]

From this exhaustive, fully tabulated survey of further experiments from 1937 to 1939, inclusive, in the development of turnip and swede varieties resistant to club root (*Plasmodiophora brassicae*) on the clay and peat soils of an estate reserved for this purpose by the Swedish Seed Association, it is clear that the six selected lines of the Majrova amply fulfilled the expectations raised by the results of previous tests [*R.A.M.*, xviii, p. 776]. Particularly satisfactory were the performances of Nos. 8026 and 8056 of strain JO13, the numbers of healthy plants of the former on clay and peat in 1939 being 71·4 and 60·9 per cent., respectively, and of the latter 95·6 and 48·8 per cent., respectively, compared with 1·5 and 3·9 and 1·3 and 6·1 per cent., respectively, for the 'standard' variety (Weibull's Original Immuna) in the two soil types. Two of the six selected lines of the cross Bortfelder × Mainaepe were also of outstanding promise, viz., the F_2 No. 8044, with 62·5 and 60·9 per cent. healthy plants in the clay and peat soils, respectively, compared with 0·7 and 3·5 per cent., respectively, for Immuna, and the F_3 No. 8060, with 54·4 and 35·6 per cent. healthy plants in clay

and peat, respectively, as against 1·3 and 2·9 per cent., respectively, for Immuna. The F_2 of Majrova JO13 was submitted for testing in 1939 to the West Gothland branch of the Association, where it also showed a notable degree of resistance to club root, besides outyielding the commercial Svälof's Majrova JO13 by 7·8 per cent. The index of specific resistance, defined as the ratio of per cent. healthy + per cent. slightly diseased plants of a selected strain to the per cent. healthy + per cent. slightly diseased plants of the standard variety, of the Majrova JO13 selection, is calculated to have increased from 1·1 in 1936 to 1·7 in 1937 and 5·4 in 1939.

GREIS (H.). **Ein Wurzelbrand an der Zuckerrübe, verursacht durch Alternaria tenuis.** [A black leg of Sugar Beet caused by *Alternaria tenuis*.]—*Phytopath. Z.*, xiii, 2, pp. 196–206, 5 figs., 2 graphs, 1940.

In examining the germinability of a sample of sugar beet seeds [? at Kleinwanzleben, Germany], all seedlings grown from these seeds were found to perish from black leg. Isolations yielded *Pythium*, *Phoma*, *Macrosporium* [*R.A.M.*, xix, p. 319], as well as *Alternaria tenuis* [loc. cit.], a species hitherto only known as a saprophyte on beet. In artificial infection experiments it was found that *A. tenuis* is spread through the seed, which it attacks saprophytically, later developing as a facultative parasite on seedlings, and killing large numbers. Excessive humidity at the time of the swelling of the seed is essential for successful infection to take place. On insufficiently dried seed the fungus spreads rapidly, and the speedy and thorough drying of seed is therefore recommended. In dry weather the incidence of the fungus is much restricted. For the control of the disease seed treatment is advised, especially as it is equally necessary against the other organisms involved in black leg. Germisan gave particularly good results when applied as a dust at the rate of 350 to 400 gm. per 50 kg. of seed. The germisan short liquid treatment was equally effective, but required subsequent drying of the material; ceresan 1875a and UT685 gave fair control.

ZAZHURILHO (V. K.). **Pea varieties with pods resistant to Ascochyta pisi Lib.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., xxix, 4, pp. 351–352, 1940.

All the pea varieties, numbering about 100, tested for their reaction (200 plants and 400 pods of each variety) to *Ascochyta pisi* at the Kamennostepnaya Plant Breeding Station, Voronezh, U.S.S.R. [*R.A.M.*, xvii, p. 427] in 1935, proved to be highly susceptible in respect of their vegetative parts, but there were noticeable differences in the effect of the pathogen on the pods. For instance, of the 20 varieties of which the reactions are shown in tabular form, six contracted under 5 per cent. pod infection, viz., Manshold, Solo, Folger Heine, Waxy O19, Concordia, and Mench, with 4·0, 4·0, 3·5, 2·7, 2·5, and 2·8 per cent., respectively, though the incidence of spotting on the vegetative parts in the same varieties amounted to 89·5, 100, 98·5, 91·5, 98·5, and 100 per cent., respectively. Not only was the actual percentage of pod infection in these varieties low, but the character of the spotting was very mild, a matter of special importance in procuring sound seed.

Hickman (C. J.). **The prevalence and significance of Pea seed infection by Ascochyta sp.**—*Rep. agric. hort. Res. Sta. Bristol, 1940*, pp. 50–54, [1941].

Examination of 29 sample lots of English-grown pea seed in 1940 revealed that 26 were infected by *Ascochyta pisi*, 8 of them to the extent of 20 per cent. or more, while of 43 foreign-grown samples only 17 were infected, of which none showed over 20 per cent. infection and only very few over 10 per cent. In a field trial in which infected Foremost seed was divided into lots containing 5, 10, 20, 30, 40, and 50 per cent. infected seeds and planted, the mean emergence was 345, 324, 294, 294, 230, and 222, respectively, and the mean crop weights 17·3, 17·6, 15·6, 15·1, 15·7, and 13·3 lb., respectively. Statistical analysis of these results indicated that unless a stock carries over 20 per cent. infection the stand is not likely to be much reduced. It also showed that if the disease does not develop beyond killing off the seed and seedlings below soil-level, seed showing 50 per cent. infection may not cause a significantly greater loss of crop than seed with only 5 per cent. infection. This raises the question of the amount of seed necessary to secure an optimum crop.

Parris (G. K.). **Comparison of rates of apparent photosynthesis and respiration of diseased and healthy Bean leaflets.**—*J. agric. Res.*, lxii, 3, pp. 179–192, 1 fig., 1 graph, 1941.

Experiments are described in which comparative measurements were made of apparent photosynthesis and of respiration in healthy bean (*Phaseolus vulgaris*) leaves and bean leaves infected by *Colletotrichum lindemuthianum* and *Erysiphe polygoni*. The results showed that leaflets infected by the former fungus assimilated 24 per cent. less carbon dioxide than healthy companion leaflets, and were restricted in growth (i.e., rate of increase in leaf area) by approximately 1·6 per cent., both differences being statistically significant. *E. polygoni* did not reduce normal assimilation until yellowing due to infection had set in. Diseased leaflets frequently abscissed prematurely while dark green and turgid. No significant difference was found between leaves affected by either fungus and healthy leaflets in respect of respiration.

Gorter (G. J. M. A.). **Chocolate spot of Broad Beans.**—*Fmg S. Afr.*, xvi, 182, pp. 167–168, 4 figs., 1941.

The sclerotial and spore dimensions of the fungus isolated from broad beans affected by chocolate spot in the western Cape Province, South Africa, are stated to correspond closely with those of *Botrytis fabae*, reported by Sardiña as the agent of a similar disease in Spain [*R.A.M.*, xi, p. 346]. Some strains of *B. cinerea* were found by Wilson to be capable of inducing chocolate spot symptoms [ibid., xvi, p. 723], but isolations of this species from olives and grapes gave negative results in the writer's inoculation tests on broad beans. A high degree of atmospheric humidity is essential for the development of chocolate spot in an epidemic form. Plants sprayed with spore suspensions of *B. fabae* and placed under bell-jars in a moist atmosphere reacted by the production of lead-coloured spots on the leaves within 24 hours. Wide

spacing of the plants and the use of well-drained sites are important means of counteracting excessive humidity.

EL-HELALY (A. F). **Further studies on the control of Bean rust with some reference to the prevention of chocolate spot of Beans.**—*Bull. Minist. Agric. Egypt* 236, 24 pp., 1939. [Received July, 1941.]

In continued experiments from 1937 to 1939 on the control of broad bean rust (*Uromyces fabae*) in several localities of Lower and Middle Egypt [*R.A.M.*, xviii, p. 567], with incidental reference to the prevention of chocolate spot (*Botrytis fabae*) in the same host [ibid., xvii, p. 646], Bordeaux mixture and bouisol gave the best results in respect of both diseases, the net profit accruing from the treatments ranging from £1 to £4 (Egyptian) per feddân [1 feddân = 0·42 hect.]. Lime-sulphur was less effective than the copper-containing mixtures, while wettable sulphur, kolofog, and kolodust were of little value for the object in view. Of the concentrations of Bordeaux mixture tested (0·25, 0·5, and 1 per cent.) the most effective and most profitable were the higher ones. Three applications of the 1 per cent. mixture reduced rust and chocolate spot from 100 per cent. each in the control to 36 and 33 per cent., respectively, in one experiment and four applications from 100 per cent. each to 10 and 12 per cent., respectively, in another. Even in seasons of low rust incidence spraying with 0·5 per cent. Bordeaux may be regarded as a profitable investment. In Middle Egypt the treatments should be carried out over a period of four to six weeks, commencing immediately upon the detection of rust or chocolate spot in the district and continuing practically up to maturity, while in the lower part of the Delta the schedule should be extended up to six or eight weeks. *U. fabae* generally makes its appearance in Middle Egypt during the first half of February, and *B. fabae* in Lower Egypt about the beginning of January, and these are the critical periods for the initial application of the fungicides. Pumps of the Bean Junior type have been found effective in combating rust and chocolate spot in large-scale field trials.

OGILVIE (L.) & WALTON (C. L.). **Diseases and pests of Onions and Leeks.**—*Worcs. agric. quart. Chron.*, ix, 2, pp. 57, 59, 61, 63, 65, 1941.

Popular notes are given on the following diseases affecting onions or leeks (or both) in the English Midlands: smut [*Urocystis cepulae*], particularly severe on White Lisbon onions and included in the Ministry of Agriculture's schedule of notifiable diseases; white rot [*Sclerotium cepivorum*], to which Up-to-Date, Rousham Park Hero, Improved Reading, and White Spanish onions are moderately resistant, leeks being only occasionally attacked; downy mildew [*Peronospora schleideniana*], to which both foliage and bulbs of the Up-to-Date onion are highly resistant; yellow dwarf [see next abstract], prevalent in England in 1940 on shallots [*Allium ascalonicum*], whence the virus is transmissible by aphids to onions, jonquils (*Narcissus jonquilla*) being also reputedly susceptible; and white tip of leeks [*Phytophthora porri*], first reported from Edinburgh in 1928 and since observed in several parts of England [*R.A.M.*, xix, p. 194].

Tate (H. D.). **Insects as vectors of yellow dwarf, a virus disease of Onions.**—*Iowa St. Coll. J. Sci.*, xiv, 3, pp. 267–294, 1940.

The distribution of onion yellow dwarf [*R.A.M.*, xix, p. 511] in Iowa is stated to be largely confined to the Pleasant Valley district, owing possibly to the fact that the commercial onion crop in this district is grown from sets, which constitute the principal over-wintering source of the virus. The disease is absent from areas where crops are produced from seed, the virus not being seed-borne. The virus is not known to attack any plant other than the cultivated onion, but it is believed that eventually additional hosts will be found. In transmission experiments with over 30 varieties of cultivated onion, the virus was transmitted from diseased to healthy plants by 48 species of aphids, whereas transmission tests with other insects, with two doubtful exceptions, gave negative results. The incubation period of the virus in the plant was relatively short, ranging mostly from 7 to 12 days with an average of 10·3. Extremely short feeding periods on a diseased plant were found sufficient to render the aphid vectors infective, and they were capable of transmitting the virus to healthy plants immediately thereafter. There was either none or an extremely short (only a few minutes) incubation period of the virus in the vector, and the infective power was lost within a few hours when aphids were fed on healthy susceptible, or immune hosts, or confined without food. Plants with masked symptoms of the disease were capable of serving as a source of infection and the disease could be transmitted from them by vectors to healthy plants. Field observations showed that the aphids were present in sufficient numbers and at the proper time to play an important part in field dissemination of the disease. Control should mainly aim at using disease-free sets and the destruction of diseased bulbs left over from the previous year. Transmission experiments with a large number of other plants (including shallot and jonquil) gave negative results.

Gibbs (J. G.), Baylis (G. T. S.), & Blackmore (L.). **Experiments in control of Onion-smut (Urocystis cepulae Frost).**—*N.Z. J. Sci. Tech.*, A, xxii, 3, pp. 162–166, 1 fig., 1941.

During 1939 onion smut (*Urocystis cepulae*) was observed on eight more properties in the Canterbury (Marshland) district of New Zealand, where it was first recorded in 1938 [*R.A.M.*, xviii, p. 82]. All the various formalin drip treatments tested for the control of the disease reduced the incidence of infection by 50 to 75 per cent., the 1 to 1·6 per cent. formulas being generally superior to those containing only 0·8 per cent. of the fungicide. Lime-sulphur as a drip treatment proved inferior to formalin, while formaldehyde dusts and mercurials were ineffectual. Attempts at the chemical disinfection of the soil were likewise unsuccessful.

Reyes (G. M.) & Romasanta (R.). **Varietal susceptibility of Peanuts to black spot (Cercospora personata (B. & C.) Ell. & Ev.).**—*Philipp. J. Agric.*, xi, 4, pp. 371–381, 5 pl., 1 graph, 1940.

In addition to the organs already known to be susceptible to black [leaf] spot of groundnuts (*Cercospora personata*) in the Philippines

[*R.A.M.*, xviii, p. 433], the writers detected the presence of the fungus on the 'pegs' [embryonic organs at the lower end of the hypocotyls], where it directly obstructs the conveyance of the elaborated nutrients required for the normal development of the pods, and other parts of the aerial system.

Well-marked differences in reaction to infection by *C. personata* were observed among the 13 varieties investigated from this standpoint, the number of spots on Tai-tau, for instance, ranging from 2·28 to 33·82 per $\frac{3}{4}$ in. sq. at the time of maximum incidence, while the corresponding figures for Macapno were from 8·09 to 79·50, the averages of three counts for the two varieties being 14·92 and 36·97, respectively. Besides Macapno, the Cayagan No. 1, Vigan Lupog, and Biit varieties may be classed as highly susceptible, six are intermediate, and two, San José No. 3 and Tai-tau, are resistant.

McLean (D. M.). **Studies on mosaic of Cowpeas, Vigna sinensis.**—*Phytopathology*, xxxi, 5, pp. 420–430, 1 fig., 1941.

Cowpea mosaic, first reported from Arkansas in 1921 (*Phytopathology*, xi, pp. 146–148), has since been detected in Indiana, Louisiana, Oklahoma (with which State the present studies are concerned), Georgia, Mississippi, Iowa, Kansas, and New Jersey. The most conspicuous symptoms, including dwarfed, slender growth and a tendency to excessive branching, being displayed by such highly susceptible varieties as New Era, Whippoorwill, and Rice Pea, which in seed transmission tests conveyed infection to 5, 4·5, and 6·8 per cent., respectively, of their progeny, the corresponding figures for the comparatively resistant Red Ripper, Black, and Iron being only 0, 0, and 1 per cent., respectively.

Cowpea mosaic is transmissible by mechanical methods from diseased to healthy plants, the use of carborundum powder as an abrasive assisting in the development of a high percentage of infection. According to Chester, however, 100 per cent. regularity is not obtainable by mechanical means (*Plant Dis. Reptr*, xxiii, [p. 247], 1939). The virus was further transmitted in cage experiments by an unidentified black aphid, *Macrosiphum solanifolii*, *Aphis gossypii*, and *M. pisi* to the extent of 100, 60, 100, and 70 per cent., respectively. *M. pisi* and mechanical inoculation were instrumental in the conveyance of the cowpea mosaic virus to Wood's Prolific Lima beans (*Phaseolus lunatus* [var.] *macrocarpus*), but a number of other Leguminosae and Solanaceae reacted negatively to transmission experiments.

The cowpea mosaic virus remained infective after ageing *in vitro* for periods up to and including 48 hours. Its thermal inactivation point lies between 72° and 75° C., and infectivity was lost at dilutions exceeding 1 in 1,000.

Heinze (K.) & Köhler (E.). **Die Mosaikkrankheit der Sojabohne und ihre Übertragung durch Insekten.** [The mosaic disease of the Soybean and its transmission by insects.]—*Phytopath. Z.*, xiii, 3, pp. 207–242, 17 figs., 1940.

A mosaic disease identical with, or at least closely related to, that described for North America [*R.A.M.*, xix, p. 256] has been repeatedly observed in soy-bean plantings in Germany. Samples of seeds harvested

from these stands contained a relatively high percentage of infected material resulting in 40 per cent. infection in plants grown from these seeds. Sap transmission of the virus, using carborundum powder, was uniformly successful, a dilution of 1 to 10,000 still causing infection, but not one of 1 to 100,000. The lethal temperature for the virus in the sap was 61° C. In unpurified sap the virus remained viable for three to four days when kept at a room temperature of 21° to 23°. The virus was transmissible by the rubbing method to beans and vetch, but it did not seem to progress from the inoculated leaves into the other parts of the plants; attempts to transmit it to garden and field peas and *Vicia villosa* gave negative results. The symptoms showed rather striking differences, indicating that the virus has several variants. One particularly necrotic type was observed causing brown lesions on the rubbed leaves three days after inoculation. The virus was successfully transmitted by the following insects: *Doralis* [*Aphis*] *frangulae*, *D.* [*A.*] *rhamni*, *D.* [*A.*] *fabae*, *Macrosiphum solanifolii*, *Myzus ornatus*, *Neomyzus* [*M.*] *circumflexus*, *Aulacorthum pseudosolani* [*Macrosiphum solani*], and *Myzodes* [*Myzus*] *persicae*, the last two achieving 100 per cent. infections and needing less than 30 minutes' feeding on both the infective and the healthy plant. Infectious aphids were capable of transmitting the virus after eight hours of starvation, but they lost their infectivity when feeding in the interval on either healthy soy-bean plants or crops resistant to the virus. Measures recommended for the control of soy-bean mosaic comprise eradication of diseased material in plots planted for seeds, isolation of such plots from infested fields (possibly through protective belts of some other crop), transference of seed growing to districts known to be free from aphids (e.g., north-eastern Germany), seed control and selection, and earlier dates of sowing as far as weather conditions and varietal characteristics allow.

VIÉGAS (A. P.). **Manchas das fôlhas da Mandioca, produzidas por Cercosporas.** [Leaf spots of Cassava produced by species of *Cercospora*.]—*Bragantia* (*Bol. téc. Inst. agron. S. Paulo*), i, 3, pp. 233–248, 4 pl. (2 col.), 1941.

The available information concerning the distribution, economic importance, symptomatology, etiology, life-history of the agents, and control of the cassava leaf spots caused by *Cercospora henningsii* [*R.A.M.*, xvii, p. 296] and *C. caribaea* [ibid., xx, p. 286] is summarized, with special reference to the environmental conditions prevailing in the State of São Paulo, Brazil. Marcus (*Tropenpflanzer*, xxxviii, pp. 144–157, 1935) recommends Bordeaux mixture for the control of *C. henningsii*, and in the writers' preliminary experiments this preparation was tolerated even by young shoots at a strength of 1 per cent. Among the varieties susceptible to *C. henningsii* in São Paulo are Vassourinha, Bujarra, Mata-negro, Cruvela, and Atalaia, while *C. caribaea* severely attacks Assú, Mata-fome, Olanda-branca, and Vassourinha, Macaé being highly resistant in the Ubatuba district. Synonyms of *C. henningsii* [*R.A.M.*, v, p. 144] include *C. cearae*, *Helminthosporium manihotis* and *H. hispaniolae*, while *Ragnhildiana manihotis* Stev. & Solh. [ibid., xi, p. 130; xv, p. 59] is regarded as a synonym of *C. caribaea*.

Ragland (C. H.). **Muscadine Grapes respond to potash.**—*Bett. Crops*, xxiv, 10, pp. 9, 44, 2 figs., 1940.

By 1935, most of the 147 vines of 20 varieties planted at the Mississippi Agricultural Experiment Station in 1921 had fallen into a low state of vigour, inducing severe leaf scorch and chlorosis [*R.A.M.*, xx, p. 101] each year at midsummer. In May, 1938, the vineyard was divided into six plots, of which (1) and (4) received 2 lb.per vine, of each of the following: sodium nitrate, potassium chloride, and superphosphate, (2) and (5) of the two first-named constituents only, and (3) and (6) of soda only. On 21st September following, plots (1), (2), (4), and (5) each received 1 lb. potassium chloride per vine. On 21st April, 1939, and 26th April, 1940, the same treatments were given as in May, 1938, but at half rates. An immediate improvement was observed in the potash-treated plots, the incidence of leaf scorch in which on 17th July, 1939, was only 8 per cent. compared with 28 per cent. in those receiving nitrogen only, while by 26th September, 1940, the vines in the potash-treated plots were completely free from leaf scorch as against 54 per cent. affected in the checks. One type of chlorosis, commencing at the leaf margins and apparently representing the incipient stage of leaf scorch, was effectively combated by the potash treatments, to which the interveinal form of the disturbance, however, failed to respond by more than a temporary delay in the appearance of the symptoms.

Williams (P. H.), White (H. L.), & Selman (I. W.). **Plant diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1940*, pp. 41–48, 1941.

In this report [cf. *R.A.M.*, xix, p. 516] P. H. Williams states that in June, 1940, of eight tomato plants received from Guernsey four yielded *Fusarium bulbigenum* var. *lycopersici* and four others *Verticillium albo-atrum*.

The Lobjoit's Improved variety of Cos lettuce was attacked by *Botrytis cinerea*, infection generally beginning at the edge of a heart leaf and spreading to the heart, which became completely rotted. The disease may have been favoured by over-dry soil, leading to water shortage and tissue collapse.

Investigations by H. L. White on root rot of French beans [*Phaseolus vulgaris*] showed that the disease is characterized by a reddish canker at the base of the stem, associated with stunting, leaf yellowing, and wilt. Two types of *Fusarium* were isolated from affected plants with sufficient consistency to justify the view that at least one is implicated in the early stages of the disease. Type A is a rather slow-growing fungus with sparse aerial mycelium and extensive blue pionnotes (on media with a high sugar content), while, under similar conditions, type B is a relatively quick-growing fungus with abundant aerial mycelium and yellow-green sporodochia. Inoculations of French bean plants with spores of type A strains invariably resulted in the production of a reddish canker at the base of the stem resembling that given by inoculation with mycelium of a non-sporing type culture of *F. solani* var. *martii* f. 3. The evidence indicated that control would be possible if the plants could be kept healthy in the seedling stages, by sowing in sterilized soil or peat and planting out into the houses with the stem protected by the rim of a bottomless pot.

I. W. Selman inoculated Potentate tomato plants growing in a cucumber house under conditions closely approximating to those of nursery practice with (*a*) a severe-mottle streak virus, which tended to induce stem streaks, (*b*) a mild-mottle streak virus (A 15), which seldom induced streaks, and (*c*) mild tobacco mosaic (TbV1 J. Johnson), which normally induced a faint, greenish leaf mottle in tomato. The percentages of flowers setting fruit in plants affected by the three diseases were, respectively, 72·5, 77·4, and 78·6 per cent., as compared with 83·9 per cent. in the controls, while the relative losses in fruit set for the three diseases were, respectively, 13·6, 7·7, and 6·3 per cent. In the severe-mottle streak group 6·6 per cent. by weight of the fruit was blotchy as compared with 3·4 per cent. in the controls.

Nearly every fruit from virus-infected plants showed faint irregularities in colour. The more severe symptoms were (1) sunken pits (which bore no simple relation to the presence of any one of the viruses), (2) dull greenish-red fruits with granular pigmentation, (3) highly glazed surface of fruit, with granular pigmentation, (4) orange or yellow blotches, and (5) longitudinal yellow streaks. Plants infected with cucumber virus 1 produced some fruits with a distinctive green and red mosaic pattern, the coloured areas being sharply demarcated; no pitting was present. Other plants containing this virus produced fruits with irregular, glazed, whitish areas. Neither of these fruit effects appeared on plants infected with the streak or tobacco virus. Certain plants infected with a streak virus (either mild- or severe-mottle) showed successively or in conjunction a considerable range of symptoms on one and the same plant.

The cash losses per acre in 1938 caused by severe-mottle streak, tobacco mild mosaic, and mild-mottle streak, amounted on the basis of these experiments and 1938 prices to £300. 9*s*., £254. 6*s*., and £185. 5*s*., respectively.

Nandi (H. K.). **Appendix II. Annual Report of the Economic Botanist, Assam, for the year 1939–40.**—*Rep. Dep. Agric. Assam, 1939–40*, pp. 85–138, 1941.

In the section of this report (pp. 130–138) dealing with plant disease investigations in Assam during the period under review, it is stated that potato plots were heavily infected with *Cercospora concors* [*R.A.M.*, xix, p. 6], but spread was arrested by spraying with Bordeaux mixture (5–5–50). Bananas were affected by bunchy top [ibid., xix, p. 584], to which the Jahaji variety seemed very susceptible. Considerable damage was caused to jute by stem disease (*Diplodia corchori*) [ibid., i, p. 21; xx, p. 167] in the Surma valley and at Nowgong, while infection also appeared in an experimental plot at Jorhat, where, however, it was controlled by roguing before the spores developed. Rice in the Golaghat subdivision was heavily attacked by *Cephalosporium oryzae* [cf. ibid., ii, p. 259] in association with insect infestation. Severe and extensive damage was done to rice in several villages by *Sclerotium oryzae* [ibid., xv, p. 313] in association with *Helminthosporium* sp. Many sugar-cane fields in the Assam valley are regularly infected by *Cercospora kopkei* [ibid., xviii, p. 500], and appreciable injury was caused in many sugar-cane plots by *Fusarium moniliforme* [*Gibberella fujikuroi*: ibid., xix,

p. 583]. The groundnut varieties shan (Magura) Cawnpore No. 23 and M. 30/38 were found to be resistant to *C. personata* [see above, p. 443].

HOPKINS (J. C. F.). **Annual Report of the Branch of Plant Pathology for the year ending 31st December, 1940.**—8 pp., Salisbury, Office of the Senior Plant Pathologist, Department of Agriculture [Southern Rhodesia], 1941. [Mimeographed.]

In this report on plant disease work in Southern Rhodesia in 1940 [cf. *R.A.M.*, xix, p. 642], the author states that barley mildew was very severe in Umtali district, seriously affecting the yield of the crops by preventing the stooling out of the young plants; perithecia of *Erysiphe graminis* were found for the first time upon disintegrated basal leaves.

Maize seed showed distinct improvement as compared with the preceding year in regard to *Diplodia* [*zeae*] infection [ibid., xix, p. 642]. That some maize plants were barren and red was found to be partly due to fungi of the *Diplodia* group, particularly *Gibberella saubinetii*, attacking the stem near soil-level. *Helminthosporium turcicum* was isolated from stalk infections.

Antirrhinum [*majus*] rust (*Puccinia antirrhini*) has been reported only once, and it is suspected that infection was brought into Rhodesia on the seed, since the outbreak occurred in a garden the owner of which has never introduced plants from outside the Colony. Numerous samples of seed from the United States, Great Britain, and the Union of South Africa were examined, and all were found to contain a high proportion of the uredospores of *P. antirrhini*. Sowings from these samples did not, however, give infected plants [ibid., xx, p. 209]. All infected material has now been burned, and the culture of antirrhinums near the infected site discontinued for at least three years. In the Union of South Africa the disease was first reported in September, 1939 [ibid., xix, p. 350], since when it has spread, apparently, throughout the entire region, where it may become a limiting factor in antirrhinum cultivation.

A species of *Phomopsis* was isolated from dead, well-grown flamboyant trees [*Poinciana regia*], which appeared to be identical with the fungus previously obtained from dying branches and considered by Fawcett to be probably a strain of *P.* [*Diaporthe*] *citri*. The flamboyant fungus grew between the bark and the wood at the base of the dead trees, and also attacked the petioles of young trees about 2 ft. high, causing shedding of all except the uppermost leaves.

Roses from England developed a serious outbreak of canker (*Coniothyrium fuckelii*) and root rot, infection apparently being brought in on the plants.

Easter lily [*Lilium longiflorum* var. *eximium*] mosaic was found to be caused by cucumber mosaic virus 1 [ibid., xix, pp. 349, 474]. The disease was transmitted from lily to cucumber by juice inoculation and by *Myzus persicae*. The symptoms were not, however, produced in tobacco. Symptom-masking in Easter lily and cucumber was induced by high temperatures. The original lilies were brought to the laboratory early in autumn. Conspicuous mottling was apparent on the leaves, the

plants were stunted, the buds were distorted, and the perianth of the flowers split on opening.

Apple trees sprayed with zinc sulphate against little leaf [ibid., xix, p. 197] showed good response to the treatment, and the work is to be continued.

Severe crinkle [ibid., xviii, p. 604; xix, p. 717] was experimentally transmitted by means of the aphid *Capitophora fragariae* from diseased to healthy Royal Sovereign strawberries. The virility of this variety could not be maintained by roguing, and small hope is entertained of propagating it successfully in Rhodesia.

Mango mildew [*Erysiphe cichoracearum*: ibid., xvii, p. 121; xx, p. 414] was widely prevalent, but was completely controlled in some cases by sulphur dusting.

The *Corticium* stage of *C. solani* was observed for the first time in the stock seed-potato plot on the high lands above the Pungwe Gorge, apparently favoured by the high humidity and low temperatures prevailing in this locality.

The chief tobacco diseases were a widespread epidemic of wildfire [*Pseudomonas tabaca*: ibid., xx, p. 180] and local epidemics of rosette [ibid., xix, p. 643]. Many outbreaks of wildfire were due to the use of diseased, untreated seed, while in some cases infection had been brought about by native snuff being dropped in the lands or seed-beds. Spraying in the field reduced the outbreaks to small proportions, and control was considerably assisted by a sudden cessation of the heavy rains, followed by a rather prolonged spell of dry weather. Very few cases of heavy loss from wildfire were reported. Assessment of losses due to rosette was complicated by the presence of sooty mould following insect infestation. Some areas were severely affected, but in many districts infection was restricted to small patches. Drastic roguing checked the disease in some cases, but in others the growers reported that no benefit resulted. Brown spot (*Alternaria longipes*) [ibid., xx, p. 180] was again destructive on late tobacco, and is now firmly established throughout the Colony. Much damage was caused in some parts, but some control resulted from field spraying, which allowed the leaf to be left in the land to ripen before being reaped.

New records, other than those mentioned above, included *Isariopsis griseola* on French beans [*Phaseolus vulgaris*], mosaic of cabbage, dwarfing of cauliflowers, and rosette of turnips due to a crucifer virus, which did considerable damage, turnip black rot (*Bacterium campestre*) [*Xanthomonas campestris*] and mildew (*E. polygoni*), lettuce mosaic, spinach leaf spot (*Cercospora spinacea*), and maize black bundle (*Nigrospora* sp.).

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz, N.S.W.*, lii, 5, pp. 274–276, 3 figs.; 6, pp. 316–320, 6 figs., 1941.

The following new host records for New South Wales were made in March, 1941: downy mildew of vegetable marrow (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*), leaf blight of cucumber (*Macrosporium cucumerinum*) [*Alternaria cucumerina*: *R.A.M.*, x, pp. 431, 771], and snapdragon (*Antirrhinum majus*) wilt (*Verticillium dahliae*) [cf. ibid., xx, p. 118]. During April the last-named pathogen was also observed

on *Gerbera jamesonii*, while another new record for the State was *Cercospora sesami* on sesame [ibid., xvii, pp. 294, 296].

Corticium vagus (*Rhizoctonia solani*) [*C. solani*] on potato tubers may be controlled by the use of clean seed, quadrennial crop rotation, and ten minutes' immersion of the tubers in acidulated mercuric chloride.

Higgins (B. B.). **Botany.**—*Rep. Ga agric. Exp. Sta., 1938–39*, pp. 60–64, [? 1940]; *1939–40*, pp. 51–57, 1 fig., [? 1941].

In the first of these reports [cf. *R.A.M.*, xviii, p. 236] it is stated that conclusive evidence has been obtained that *Macrosporium* [*Alternaria*] *solani* may live over in the soil to a slight extent into the second year, and that tomatoes cannot safely be grown in an [affected] field in alternate years.

Non-winter-hardy pea varieties (208 different seed lots) were grown in pots in hot-beds covered with cloth and heated electrically just sufficiently to prevent freezing. The plants were inoculated with the black stem and leaf spot fungi (*Ascochyta pinodella* and *Mycosphaerella pinodes*) [ibid., xx, p. 211]; the plants of some varieties rapidly succumbed, while those of others, of which Austrian Winter proved to be one of the best, developed little infection until late in spring. Evidence was obtained that the black-stem fungi can live at least 13 months in old pea stems kept out of doors, and at least 18 months in dry pea stems. These fungi and also *Septoria pisi* can live for more than nine months in sterilized sand, clay soil, and composted soil. That these organisms can persist so long under such a variety of extreme conditions emphasizes the need for rotation. *M. pinodes* has been recovered from infected seed stored for 14 months, and under some storage conditions may live, apparently, for five years.

In the second report it is stated that three applications of sulphur dust markedly reduced groundnut leaf spot [*Cercospora* (*Mycosphaerella*) *arachidicola* and *C. personata* (*M. berkeleyii*): ibid., xix, p. 453] and leaf-shedding, and gave an average increase in yield of 168 lb. nuts per acre, or 16 per cent., while with four applications the figure was 206 lb. or 20 per cent. Other work indicated that sulphur entering the soil may have value as a direct nutrient or in releasing other nutrients needed by the groundnut plants.

Groundnut seed treatment in many cases gave significant increases in germination. Field surveys showed that poor yields in groundnuts are generally due to poor stand. In two replicated field sowings made in south Georgia in the spring of 1940, conspicuous improvement in field stand was brought about by dusting with ceresan at the rate of 3 oz. per bush. seed, this being especially the case with machine-shelled seed; with hand-shelled seed increase in germination was less, amounting to about 5 per cent.

In seed disinfection tests against *Macrosporium* stem canker and leaf spot [*A. solani*] of tomato, new improved ceresan at the rate of 1 oz. per 15 lb. seed, and new improved ceresan jr. (3 oz. per 10 lb.) gave perfect control of seed-borne infection, with little or no seed injury after several months' storage in the laboratory. Tomato seeds in dry storage were found to be completely free from viable *A. solani* spores after one year.

The most serious vetch (*Vicia* spp.) disease in Georgia is root rot (*Aphanomyces euteiches* and possibly other fungi) [ibid., xix, p. 709]. Observations during a severe outbreak in 1939 indicated that *V. villosa* and *V. hybrida* are resistant, while *V. sativa*, *V. monantha* [*V. calcarata*], *V. dasycarpa*, and *V. pannonica* are susceptible.

PERLBERGER (J.). **Gall diseases of deciduous fruit trees.**—*Yedeoth*, v, 1–2, pp. 31–41, 11 figs., 1939. [Hebrew, with English summary on p. 92. Received July, 1941.]

Stone fruit trees of all kinds in Palestine are subject to root and root-collar galls due to *Pseudomonas* [*Bacterium*] *tumefaciens*, from which pomes, on the other hand, are relatively free. In nurseries and orchards the disease may be prevented by immersion of the seedling roots in disinfectant solutions containing heavy metals, while a reduction in the incidence of existent infection may be effected by excision of the galls and antiseptic treatment of the resultant wounds. Isolated cases of 'tuberculosis' [knot] (*P. savastanoi*) were observed on olive trees. Brown knot of quinces is thought to be of physiological origin.

DOWSON (W. J.). **The identification of the bacteria commonly causing soft rot in plants.**—*Ann. appl. Biol.*, xxviii, 2, pp. 102–106, 1941.

The soft-rotting bacteria occurring in Britain include *Bacterium carotovorum* [*Erwinia carotovora*] (the commonest), *Bact. phytophthorum* [*E. phytophthora*: *R.A.M.*, xix, pp. 113, 360] apparently confined in nature to the potato, *Bact.* [*E.*] *aroideae*, reported on arum corms and hyacinth leaves, though in the United States it has a wider host range than *E. carotovora*, *Bact. rhaponticum* [ibid., iii, p. 628], apparently found only on rhubarb and restricted to Britain, and *Pseudomonas marginalis*, which causes lettuce marginal spot.

The author's method for isolating soft rot bacteria is to remove aseptically fragments of the decayed tissues by means of a wire loop or forceps and transfer them to tubes containing 5 ml. sterile water. In 20 minutes the bacteria have diffused out. A loopful of the suspension is streaked on to plates of bullock heart infusion agar of P_H 6·8. After two to three days' incubation, transfers are made to slopes of the same medium from all colonies differing in appearance.

To demonstrate pathogenesis, densely turbid suspensions are made from these pure cultures by transferring a large quantity of the bacterial growth to tubes containing 5 ml. sterile water; after shaking, loopfuls are transferred from these to freshly cut surfaces of slices of onion or cucumber in Petri dishes containing plenty of water. At least one dish is kept as a control. Within 24 hours at room temperature any of the five bacteria mentioned above will have started to set up decay. Rotting is almost complete in three days when due to *E. aroideae*, *E. phytophthora*, or *P. marginalis*, and in five or six days when due to either of the other two. If neither the well-separated colonies on isolation plates nor the surrounding liquid of the rotted slices are greenish, it may be assumed that the organisms concerned are *Bacterium* [or *Erwinia*] and not *Pseudomonas*. The species can then be distinguished by their biochemical reactions and different pathogenic abilities, both of which are summarized. The rot of potato tubers caused by inoculation

with *P. marginalis* is characterized by a buff colour and some of the rotting of potato tubers in soil and in storage may be due to this organism.

POSNETTE (A. F.). **Swollen-shoot virus disease of Cacao. (Review of research work to November 1940.)**—*Trop. Agriculture, Trin.*, xviii, 5, pp. 87–90, 1 plan, 1941.

After briefly reviewing earlier investigations into cacao swollen shoot on the Gold Coast [*R.A.M.*, xx, p. 342], the author states that in numerous inoculation experiments by E. F. S. Shepherd with a strain of bacteria cultured from swollen tissues and with extracts of crushed swollen tissue no transmission was secured. In further budding work by the author [cf. ibid., xix, p. 521] three plants were budded after being kept for a year in insect-proof cages, and the first definite symptoms appeared three months later on all plants, though the controls remained healthy. Ten healthy uncaged plants in an uninfected plot were also budded, and all became affected, though all the untreated plants were healthy. At Aburi, ten miles from the nearest known case, 90 plants were budded with swollen shoot, and all developed characteristic chlorosis; when 18 had developed typical swellings all were destroyed.

The disease was found in two-months-old squirrel-sown seedlings under infected trees. As this suggested seed transmission, a test was made in insect-proof cages, using only dwarfed pods from trees almost killed by the disease. Conclusive evidence was obtained that some beans from infected trees carry the virus, and it appears that in any one dwarfed pod, either all or none of the beans are affected. No transmission was secured with beans from normal pods taken from infected trees.

Possible vectors include *Mesohomotoma tessmanii*, *Toxoptera aurantii*, and *H*[*eliothrips*] *rubrocinctus*, and of these only the first has given positive results in experimental work.

The first recognizable symptom [loc. cit.] is generally a chlorosis of the young leaves, which are mottled, and bear a fine mosaic. This mosaic may develop into a general chlorosis or rarely may be masked by further development of chlorophyll. Some defoliation may precede but usually follows chlorosis and subsequent flushes of growth are much reduced. The period between the first appearance of the mosaic symptoms and complete defoliation may be as short as four months but usually requires 9 to 12 months. Die-back follows rapidly after defoliation, but the main trunk may not die for a year or more. The characteristic swellings develop on vigorous growth and may sometimes appear on a basal chupon before the mosaic has developed. Trees in the early stages of infection fruit heavily but after defoliation starts few pods are formed.

Two types of swollen shoot are recognizable, the common form characterized by marked chlorosis, rapid die-back, and few swellings, and a 'mild' or 'Bisa' strain, accompanied by very little chlorosis, slow deterioration, and many pronounced swellings. Transmission of each type has been effected by budding.

All the evidence indicates that the disease is spreading with such

rapidity that other forms of die-back are masked by it. Infection nearly always precedes die-back. Control measures devised to cure drought die-back by improving the environment of the cacao are regarded as of little or no value against swollen shoot. The district for some 250 sq. m. round Akwadum is too severely infected to justify control. The most that can be done here is to restore forest conditions suitable for the re-establishment of cacao in the future.

Baker (R. E. D.), Crowdy (S. H.), & Thorold (C. A.). **Witches' broom disease investigations. I. Seasonal variations in intensity of infection and their effect on control methods.**—*Trop. Agriculture, Trin.*, xviii, 6, pp. 107–116, 7 graphs, 1 plan, 1941.

Observations from 1930 to 1934 on cacao witches' broom (*Marasmius perniciosus*) [*R.A.M.*, xix, p. 391] on the Marper estate, Trinidad, showed that in each year there was a well-marked maximum of broom production in February or March, and a slight secondary maximum in September or October. A well-marked minimum was apparent each July. Pod losses at Marper since 1932 have been low, the two highest totals being only 10 and 8·67 per cent., in 1939 and 1937, respectively. In 1934, many brooms were removed, but pod loss amounted only to 1·33 per cent. When, however, infection is very severe pod losses in individual pickings may rise to 80 per cent.

Evidence was obtained confirming the view that severe outbreaks are due to the presence of mushrooms in the affected field or its vicinity. Mushrooms generally form on brooms still attached to the tree, but they also occur on the leaves of brooms, diseased pods, and affected material lying on the ground. In a wet locality they are produced at all seasons, but most abundantly from September to January, inclusive. All the evidence [which is given in detail] indicated that mushroom production and resultant infection are favoured by wet districts and wet years.

A broom usually takes at least three months to produce sporophores and if the brooms were cut out every three months the disease would presumably be controlled. Such a measure has, however, proved impracticable since it is (1) expensive, (2) difficult to carry out, requiring more skilled labour than is often available, and (3) clashes with other operations, such as harvesting. The most practicable modification of this method of control would appear to consist in removing as many brooms as possible between May and August, when both broom formation and sporophore production are at their lowest, and this should be followed by another removal in October and November. This scheme requires testing at once, and if it proves ineffective, all attempts at direct control by removal of brooms will probably have to be relinquished.

Baker (R. E. D.). **Immortelle disease.**—*Trop. Agriculture, Trin.*, xviii, 5, pp. 96–101, 2 figs., 1941.

During recent years 'Anauca' (*Erythrina micropteryx*) and 'Bocare' immortelle (*E. glauca*) trees in Trinidad have shown severe infection by *Calostilbe striispora* (Ell. & Ev.) Seaver [cf. *R.A.M.*, iv, p. 724; viii,

p. 69; xvii, p. 729]. The condition is widespread, but is particularly severe in the low-lying Sangre Grande and Manzanilla districts, where in 1928 the Bocare immortelles began to die off rapidly. Since then, hundreds of trees of this variety have succumbed, and the disease has also attacked Anauca immortelle, cacao, and *Hevea* rubber to a considerable extent. The fungus was observed once on 'bois canon' (*Cecropia peltata*) and is common as a saprophyte on cacao husk heaps.

The symptoms are essentially similar on immortelle, cacao, and rubber. The disease is one of the bark and not of the root On *E. glauca* the lesions may occur anywhere on the trunk, the main branches, the buttress roots, or the main roots. Infection has been found on branches 45 ft. above, and on the trunk and main roots beneath, the ground. Attacks are most frequent on the buttress roots at or near ground-level. The rhizomorphs occur in the bark and secondary phloem, or sometimes in the wood, there being generally a very thick mat of them in the cambial region. They are flattened and white, gradually turning mauve, purple, and finally blackish-purple.

Spores are produced abundantly in coremia and perithecia on the surface of the lesions. The coremia measure 3 to 10 mm. in height, and show dark red heads up to 3 mm. in diameter and white stalks. The 4-celled conidia measure approximately 50 by 14 μ, are dark red in the mass, and are frequently immersed in a drop of fluid. The conidiophores show a swelling just below each conidium, and are interspersed with long, septate paraphyses. The perithecia are superficial, pale greenish-yellow, and densely cespitose. The ascospores are similar in size to the conidia but bicellular and conspicuously striate.

As the large size of the spores would appear to preclude air distribution, it seems probable that the disease is most commonly spread by water and by the movement of debris containing spores or mycelium. Infection probably takes place through wounds in the bark of the trunk and main roots.

Successful inoculations with mycelium from cultures and living bark, and conidia were made on both species of immortelle, the fungus being readily reisolated from the diseased material. Inoculations on cacao gave negative results and only about 25 per cent. of all inoculations made were successful. These results indicate that the fungus can parasitize only unhealthy or damaged trees. The disease is never likely to be serious on rubber, cacao, or *E. micropteryx*, which was more difficult to infect than *E. glauca*.

On rubber the only control required is periodic inspection of the trees and the removal of diseased lesions, with disinfection of the wounds. Heavily infected trees should be destroyed.

On cacao slight infections may be treated surgically. Heavily diseased trees should be destroyed. If the disease is rife, the conditions are probably too damp, or the field needs replanting. Control on *E. micropteryx* should follow similar lines. *E. glauca*, on the other hand, appears to be too susceptible to be of any value as a shade tree in the Sangre Grande and Manzanilla districts of Trinidad, and should be replaced by some other shade tree. Very old immortelle trees constitute a problem on cacao plantations even when healthy, and a policy of shade replacement in definite rotation before the trees become too large

might prove highly effective against the disease and in preventing damage by falling trees.

Simmonds (P. M.). **Rootrots of cereals.**—*Bot. Rev.*, vii, 6, pp. 308–332, 1941.

In this paper, to which a bibliography of 104 titles is appended, the author briefly reviews and discusses some of the trends which have appeared in recent years in research work on cereal root rots caused by *Ophiobolus graminis*, *Cercosporella herpotrichoides*, *Helminthosporium sativum*, *Colletotrichum graminicola*, and other fungi [cf. *R.A.M.*, xix, p. 660].

D'Oliveira (B.) & De Sousa (M. C. F.). **Raças fisiologicas da Puccinia graminis tritici em Portugal.** [Physiologic races of *Puccinia graminis tritici* in Portugal.]—*Agron. lusit.*, ii, 3, pp. 243–252, 1940. [English summary.]

Collections of wheat leaves and culms bearing uredosori of *Puccinia graminis tritici*, made throughout Portugal [*R.A.M.*, xx, p. 353] from 1937 to 1939, yielded six physiologic races of the rust, namely, 14 (predominating), 15, 24, 27, 40, and a new one, isolated only twice from material obtained in the extreme south, designated 187, characterized by heavy infection on the Jenkin and Marquis varieties, slightly less severe on Arnautka and Mindum, moderate on Reliance and Kota, slight on Spelmar, Kubanka, Acme, and Vernal, and very mild on Khapli, einkorn [*Triticum monococcum*] being immune. A table is given showing the reaction to races 24, 27, and 40 of a number of Portuguese wheats.

Yarkina (Mme A. M.). Расовый состав бурой ржавчины по Саратовской области в 1938–39 гг. [Races of brown rust in the Saratoff region in 1938–39.]—*Socialist. Grain Fmg, Saratoff, 1941*, 1, pp. 176–183, 2 figs., 1941.

Collections of wheat from 14 different localities in the Saratoff region, U.S.S.R., during the dry seasons of 1938 and 1939 yielded physiologic race 20 of *Puccinia triticina* previously reported from other parts of the Union, and a hitherto unobserved race, designated 109–C, the most prevalent in the region. The new race showed grade 1 infection in the differential varieties Mediterranean and Democrat, and grade 2 in the other six. Its presence was noted in samples from fields where races 10 and 65 had been found in previous years.

Broyakovsky (N. V.). Поражаемость сортов озимой Пшеницы бурой листовой ржавчиной и сортов Овса корончатой ржавчиной. [The susceptibility of Winter Wheat varieties to brown leaf rust and of Oat varieties to crown rust.]—Научн. Зап. по Сахарн. Пром. [*Sci. Notes Sug. Ind.*], Kieff, [Grey Ser.], xvii, 1–2, pp. 87–99, 1940.

The results are computed of trials of wheat (160 varieties) and oats (69) tested in a number of experimental stations in the Ukraine for resistance to *Puccinia triticina* and *P. coronifera* [*P. coronata*], respectively. None of the varieties tested was absolutely resistant to rust, but the most promising wheats were 074 Lessostepka, 055, and

037 from the Belaya Tzerkov Station; 6–66, 6–86, and 6–176 from Vessely Podol; 0, 9, 010, and 013 from Verkhnyatchka; 054, 080, and 0153 from Nemertchanskaya; and 27/24 F 8L/3, and 27/24 F 84/3 from Mironovo; the best oats were 682–23 from Vessely Podol; 26–2015, 26–1655, and 26–1363 from the Mironovo Station; and 339 2/24 and 528 2/24 from the Verkhnyatchka Station. The author stresses the progress made in the production of disease-resistant wheats and to a lesser extent of oats during the period of the observations (1929 to 1937).

Yarkina (Mme A. M.). Физиология больного растения при поражениях ржавчиной (**Puccinia triticina**) в условиях орошения. [The physiology of the diseased plant infected with rust (*Puccinia triticina*) as affected by conditions of watering.]—*Socialist. Grain Fmg, Saratoff, 1940*, 4, pp. 137–150, 8 graphs, 1940.

In field and laboratory experiments conducted during 1934 at the Valouysk Experiment Station [south-east Russia] it was found that photosynthesis was much more intense in watered than in unwatered wheat. Weak infection with *Puccinia triticina* [*R.A.M.*, xix, p. 391] had a stimulating effect upon the photosynthesis (resulting in a maximum increase of 281 per cent. in watered and 430 per cent. in unwatered plants), whereas severe infection had the opposite effect, the average decrease in intensity amounting to 81 and 87 per cent. in watered and unwatered plants, respectively. Similar results were obtained in the previous year with sunflower infected with *P. helianthi* [ibid., xvi, p. 539]. The transpiration of weakly infected wheat leaves is increased by 20 to 60 per cent., while in severely infected ones it is two to three times more intense than in healthy ones. It appears from these facts that severe rust infection can induce a rapid exhaustion of the plant in so far as it considerably lowers the capacity of the plant to assimilate carbon dioxide from the air and at the same time considerably increases the loss of organic matter incurred in the process of transpiration. The increased rate of transpiration in even weakly infected plants leads to a greater demand for water and in consequence the stomata remain wide open, facilitating the penetration of the parasite into the plant, and thus favouring the development of severe infection in susceptible wheats. Another factor favouring infection is the intensified assimilation of carbon dioxide under the influence of watering, which ensures optimal conditions for the development of the fungus.

Johnston (C. O.) & Miller (E. C.). **Modification of diurnal transpiration in Wheat by infections of Puccinia triticina.**—*J. agric. Res.*, lxi, 6, pp. 427–444, 1 fig., 4 graphs, 1940.

Greenhouse studies [which are fully described] conducted over a period of three years on the effect of infection by *Puccinia triticina* [see preceding abstract] on the transpiration of a resistant and a susceptible variety of spring wheat showed that rusted, susceptible plants of Pusa No. 4 variety transpired 13·17 and 32·7 per cent. more than the healthy controls for periods aggregating 48 hours in two seasons, respectively. On the other hand the rate of transpiration of the resistant plants (Pusa 52×Federation in 1935 and Reward in 1936) was little affected by the rust (+5·05 and −1·6 per cent., respectively). The

diurnal rhythm of transpiration was seriously disturbed in the rusted, susceptible plants, which transpired much more than the healthy controls during the night. In two seasons this nocturnal increase over the controls was 83·41 and 89·62 per cent. respectively. The higher transpiration rate of affected plants at night appeared to be due partly to transpiration through ruptures in the cuticle caused by the uredosori and partly to the transpiration of the fungus itself.

STANFORD (E. H.). **A new factor for resistance to bunt, Tilletia tritici, linked with the Martin and Turkey factors.**—*J. Amer. Soc. Agron.*, xxxiii, 6, pp. 559–568, 2 graphs, 1941.

A tabulated account is given of the writer's studies at the University of California on the genetics of the inheritance of resistance to bunt (*Tilletia tritici*) [*T. caries*] (race III of Reed [*R.A.M.*, viii, p. 488] or T-1 of Rodenhiser and Holton [ibid., xvii, p. 165]) in the Rio, C.I. 10061 hard red winter wheat variety. During the seven-year period since the introduction of this variety into the nursery at Davis, its average incidence of infection has been 1·2 per cent., with a maximum of 5·8 in 1937. Rio was crossed with (1) the highly susceptible white Baart, (2) Turkey 3055, (3) Selection 1403, and (4) Martin. The existence of a new factor for bunt resistance was demonstrated in Rio, to which the symbol RR has been assigned; when present in the heterozygous condition this factor permits some 50 per cent. infection of the plants. The factors present in Baart modify the influence of Rio, allowing the development of a small percentage of bunt (9·3). The crosses between Rio and (a) Selection 1403 and (b) Turkey yielded further evidence that a single factor controls the resistance of the first-named: it was shown to be closely linked with the factor operative in Turkey and more remotely with that governing the reactions of Martin.

El Khishen, in an unpublished investigation with the same race of bunt, discovered an additional factor in Turkey 10016 which he designated XX, while Turkey 10015 was found to contain a weak factor, YY.

TANAKA (I.). **Phytophthora macrospora (Sacc.) S. Ito et I. Tanaka on Wheat plant.**—*Ann. phytopath. Soc. Japan*, x, 2–3, pp. 127–138, 7 figs., 1940. [Japanese, with English summary.]

The conidial stage of the fungus herein referred to *Phytophthora macrospora* (Sacc.) S. Ito & I. Tanaka nov. comb. (syn. *Sclerospora macrospora* [*R.A.M.*, xiii, p. 804], *S. kriegeriana*, and *S. oryzae* [loc. cit.]) was first observed on rice by Tasugi in 1927 and transferred by him to *Nozemia*. In 1937 the author detected the same phase of the organism on wheat plants severely attacked by downy mildew following a flood in Hokkaido. The conidia measured 57·5 to 97·5 by 30 to 65 (average 74·6 by 46·8) μ on the plant, but when the leaves were soaked in water elongated to 65 to 112·5 by 32·5 to 55 (87·37 by 43·75) μ, the latter dimensions agreeing with those reported by Tasugi; production took place in abundance at 11° to 24° C. The oogonia of *P. macrospora* in wheat tissues measured 55 to 100 by 50 to 95 (69·12 by 65·13) μ, the paragynous antheridia 22·5 to 41·25 by 12·5 to 22·5 (27·75 by 15·15) μ,

the oospores 42·5 to 72·5 by 42·5 to 70 (60·25 by 56·67) μ, and the zoospores 12·5 to 16·25 by 10 to 12·5 (14·17 by 10·8) μ.

Zanevicz (V. E.). Влияние гриба **Trichoderma lignorum** на нарастание прочности структуры почвы и урожайность озимой Пшеницы и Овса. [The influence of the fungus *Trichoderma lignorum* on the consolidation of soil structure and the yield of Winter Wheat and Oats.]—Научн. Зап. по Сахарн. Пром. [*Sci. Notes Sug. Ind.*], Kieff, [Grey Ser.], xvii, 1–2, pp. 122–125, 1940.

Soil inoculation with *Trichoderma lignorum* [*T. viride*: *R.A.M.*, xix, p. 322] in a field near Kieff, Ukraine, during 1938 considerably promoted the consolidation of soil structure and increased the yield of winter wheat by from 5·5 to 6·8 per cent. where the inoculation was carried out in spring and in autumn, and by from 13·3 to 14·0 per cent. where it was done only in autumn. Oats grew better on inoculated soil and gave an increase in yield of 6·5 per cent. when the soil was inoculated in autumn, and one of 4·7 per cent. when seeds were inoculated in spring.

Holton (C. S.). **Further studies on the Oat smuts, with special reference to hybridization, cytology, and sexuality.**—*J. agric. Res.*, lxii, 4, pp. 229–240, 3 figs., 1941.

Seven races of the buff type of oat smut were identified at Washington; one of them, a mutant from *Ustilago levis* [*U. kolleri*: *R.A.M.*, xv, p. 569], was collected in the field, another arose through mutation, and five through hybridization of buff races 1 or 2 with either *U. kolleri* or *U. avenae*. It appeared from the crossing experiments that new races of the buff smut could be produced at will by crossing any race of the buff fungus with races of the other two. The mature chlamydospores of the buff smut contained a single diploid nucleus. Meiotic division of this nucleus accompanied spore germination and each cell of the promycelium and each sporidium contained a single haploid nucleus. When sporidia of opposite sex fused, the nucleus from one passed into the other and thence the paired nuclei passed into the infection hyphae. It is presumed that the binucleate condition persists throughout the parasitic stage, nuclear fusion occurring when the spores become mature. The factor for powdery sorus type was dominant over that for indurate sorus type and the segregation and recombination of these characters occurred in a simple 3 : 1 ratio basis. Active or passive participation of sporidia in the fusion process appeared to be governed primarily by their 'physical' condition and not by sex. Thus, sporidia budding on plain agar responded more rapidly to the fusion stimulus than those on potato dextrose agar.

Gallagher (P. H.) & Walsh (T.). **Investigations on grey speck disease of Oats on some Irish soils.**—*Proc. R. Irish Acad.*, Sect. B, xlvi, 11, pp. 143–159, 4 pl., 1941.

Grey speck of oats has been observed in Co. Monaghan and at six centres near Dublin, mostly on grey or black loam soils of a slightly alkaline reaction and containing appreciable amounts of calcium carbonate. In pot experiments at University College, Dublin, the disease

was effectively combated by soil treatments with manganese sulphate [*R.A.M.*, xx, p. 251], at a rate equivalent to 100 lb. per acre (in solution), acid peat mould (one part per 20 of soil by weight), 1 per cent. tartaric acid, and formalin [amount not stated]. The development of the symptoms was prevented by the maintenance of an adequate supply of soil moisture, while drought accentuated the trouble. In manurial trials in pots the omission of potash from the dressing considerably mitigated the intensity of the disease, which was further shown by field experiments to be economically controllable by the application to the crop, towards the end of June, of a 1 per cent. manganese sulphate solution at the rate of 100 to 120 gals. (10 to 12 lb. of the salt) per acre, which increased the weight of the grain from $3\frac{3}{4}$ to $5\frac{5}{8}$ lb., and that of the straw from $6\frac{1}{4}$ to $8\frac{1}{4}$ lb., both calculated per sq. perch. Of the seven varieties included in a series of pot tests, the Scottish-grown Star was the most resistant, whereas Early Miller, also of Scottish origin, was highly susceptible; Glasnevin Success, Victory II, and *Avena nuda* were severely attacked in the early part of the season but made satisfactory recovery later. Potato oats were observed in the field to be very resistant, as already noted in Wales [ibid., xi, p. 295].

Stevens (N. E.) & Wilson (W. E.). **A biotin-like substance produced by Diplodia zeae.**—*Science*, N.S., xciii, 2419, pp. 458–459, 1941.

In the course of a study at the University of Illinois on the physiology of the maize pathogens *Diplodia zeae* and *D. macrospora*, the former species was observed to produce a substance essential for the growth of both. A concentrate obtained from a synthetic medium which had been staled for four or five weeks by *D. zeae*, was found to possess properties very similar to those of biotin. In a medium prepared by autoclaving the white of a fresh egg and 10 ml. of an aqueous solution of a concentrate of the staled medium, adding the required aliquots of dextrose and minerals and then autoclaving again, both *D. zeae* and *D. macrospora* grew well; on the other hand, the growth of the former species was markedly reduced and of the latter completely inhibited when raw egg white (recently reported to inactivate biotin *in vitro*) was added aseptically to a 500 ml. of sterile medium containing 10 ml. of staled solution.

Phytophthora disease.—*Indian Fmg*, ii, 2, p. 83, 1941.

In tracts of heavy rainfall in Coorg, Madras, and Mysore, the loose-jacketed Coorg orange (*Citrus nobilis*), extensively grown at altitudes of 1,500 to 4,000 ft., is subject to severe infection by a species of *Phytophthora* attacking the foliage, young fruits, and stem bark. The attack usually begins in July, and heavy leaf-shedding and fruit drop take place during the peak of the south-west monsoon. Cankers are formed on the trunk and branches about December and January, when dew and mists are prevalent. All three forms of the disease were effectively combated in experiments in the Wynaad hills (Madras) by two applications of 1 per cent. Bordeaux mixture, the first in May to June just before the outbreak of the monsoon, and the second in July, when fungal activity reaches a climax. The spread of bark cankers

may be arrested by scraping the wounds and treating them with Bordeaux paste.

Ruehle (G. D.) & Thompson (W. L.). **Commercial control of Citrus scab in Florida.**—*Bull. Fla agric. Exp. Sta.* 337, 47 pp., 5 figs., 1939. [Received August, 1941.]

The following results were obtained in the writers' experiments, extending from 1934 to 1939, on the combined commercial control of citrus scab (*Elsinoe fawcetti*) and scale insects in grapefruit, Samson tangelo, and King orange groves [see next abstract] in Florida. Since the scab organism is perpetuated mainly on diseased foliage, there is a marked tendency for it to increase in severity if fungicides are withheld. The best time for the application of disinfectants appears to be during the period immediately preceding the spring flush, while in small groves good results have also been secured in the last of the bloom. In cases of severe infection of overwintered foliage, Bordeaux mixture 6–6–100 is recommended for the pre-growth spray, but 3–3–100 has given excellent control of scab on the new leaves where infection on the previous season's foliage was mild, and the latter strength should also suffice for bloom and post-bloom treatments provided a dormant treatment has been applied. Adequate protection against scab is usually conferred by the last-named treatment in mild cases.

Basic copper sulphate, copper hydroxide (40 per cent.), and ammonium copper silicate are equally effective with Bordeaux mixture for scab control if used in formulas containing the same amounts of metallic copper, and combine just as well with insecticides. On the other hand, lime-sulphur 4 in 100, with added wettable sulphur, gives only partial control of the disease in a moderate or severe form, and sulphur sprays fail to remove melanose [*Diaporthe citri*] blemishes from the fruits. Mercury-oil emulsions are similarly unreliable. Older trees attacked by both scab and melanose require two copper treatments, one dormant and another during or after the blossom.

Fawcett (G. L.). **La verrucosis de los Citricos.** [Citrus scab.]—*Circ. Estác. exp. agríc. Tucumán* 94, 3 pp., 3 figs., 1940.

The following directions are given for the control of scab of sweet oranges (*Sphaceloma*) [*fawcettii* var. *viscosa*: *R.A.M.*, xvi, p. 95] and that of lemons and bitter oranges (*S.* [*Elsinoe*] *fawcetti*) [ibid., xix, p. 366 and preceding abstract] in Tucumán, Argentina: (1) an application of 0·75 per cent. Bordeaux mixture shortly before the commencement of flowering (end of August under local conditions); (2) a further treatment at 0·5 per cent. when most of the flowers have fallen. A later spray may be advisable in cases of heavy infection, but as a general rule its benefits do not outweigh the costs of material and labour. The application of Bordeaux mixture to the trees promotes the development of scale insects, for which reason an insecticide should be used a few days later. Attempts to combine the fungicidal and insecticidal operations in a single treatment by the admixture of an oil emulsion with the Bordeaux mixture proved unsuccessful, as regards the particular object in view, but demonstrated the value of the oil in procuring the uniform distribution of the liquid over the leaf surfaces.

[This paper also appears in *Rev. industr. agríc. Tucumán*, xxx, 10–12, pp. 227–229, 3 figs., 1940.]

Camp (A. F.) & Fudge (B. R.). **Some symptoms of Citrus malnutrition in Florida.**—*Bull. Fla agric. Exp. Sta.* 335, 55 pp., 8 col. pl., 11 figs., 1939. [Received August, 1941.]

The symptoms of copper, zinc, manganese, magnesium, nitrogen, iron, and boron deficiency in Florida citrus groves are clearly described and illustrated by means of excellent coloured plates and photographs. Reference has been made from time to time to a number of these disturbances, including die-back, associated with lack of copper [*R.A.M.*, xviii, p. 518], and frenching or mottle leaf [loc. cit.] (zinc deficiency).

Leroy (J. V.) & Hendrickx (F. L.). **Contribution à l'étude des dégats causés par les Antestia aux Caféiers (Coffea arabica L.).** [A contribution to the study of the depredations caused by species of *Antestia* in Coffee (*Coffea arabica*) plantings.]—Reprinted from *Centre afr., 1941*, 393, 1 p., 1941.

The severe depredations inflicted by Pentatomidae of the genus *Antestia* (? *A. lineaticollis* or *A. faceta*) in the coffee plantations of the Belgian Congo are not confined to direct injuries by the insects themselves, but serve as channels of ingress for *Nematospora coryli* and possibly *Ashbya* [*N.*] *gossypii* [cf. *R.A.M.*, xii, p. 8; xiii, p. 114; xix, p. 72], while a species of *Fusarium* [ibid., xix, p. 330], associated with peduncle decay but incapable of provoking it unaided, and other fungi (species of *Pestalozzia* and *Mucor*) have been isolated by the authors from the rostra of the insects.

Nakayama (T.). **A study on the infection of Cotton seedlings by Rhizoctonia solani.**—*Ann. phytopath. Soc. Japan*, x, 2–3, pp. 93–103, 3 figs., 1940. [Japanese summary.]

The invading hyphae of *Rhizoctonia* [*Corticium*] *solani*, inoculated into cotton seedlings in Petri dishes, proceeded along the slight depression in the epidermis above the junction of the epidermal cells of the root, hypocotyl, and cotyledon, the depression becoming intensified as the hyphae adhered more closely [*R.A.M.*, xi, p. 454]. The root tips proved very susceptible to infection, the fungus penetrating the epidermis and branching out inter- and intracellularly into the endodermal region. Permeation of the root was likewise effected through the natural injuries associated with the extrusion of new secondary rootlets from the tap root. 'Infection cushions' were the principal means of ingress into the hypocotyl, infection by simple hyphae occurring rarely. The cuticle and stomatal apertures served as sites of entry into the cotyledons, the lower surface being penetrated chiefly through the latter channel, while both types of infection were present on the upper side.

Nisikado (Y.), Kimura (K.), & Miyawaki (Y.). **On two Alternaria species injurious to Cotton fibre in balls.**—*Ann. phytopath. Soc. Japan*, x, 2–3, pp. 214–230, 7 figs., 2 graphs, 1940. [Japanese, with English summary.]

Two species of *Alternaria*, *A. macrospora* [*R.A.M.*, xix, p. 72] and

A. (?) *gossypii*, were recently found attacking cotton fibres in nearly mature balls in western Japan, the former also affecting the foliage while the latter is mostly confined to the fibres. The inoculation of cotton balls of varying degrees of maturity and of commercial and absorbent cottons resulted in discoloration or blackening of the fibres in all except the last-named. The minimum, optimum, and maximum temperatures for the mycelial growth of both species were 5°, 27° to 30°, and 36° C., respectively, and the minimum, optimum, and maximum hydrogen-ion concentrations P_H 2, 5, and 10, respectively.

Adair (L. A.) & Moore (Elizabeth J.). **A photoelectric method and its use for determination of fungus growth rates.**—*Phytopathology*, xxxi, 5, pp. 448–452, 1 diag., 1 graph, 1941.

Details are given of an accurate and rapid photoelectric method for the determination of the amount of growth produced by the cotton root rot fungus [*Phymatotrichum omnivorum*]. The results secured by means of this technique agree closely with the data yielded by gravimetric methods for larger colonies, while for smaller ones the photoelectric instrument is more reliable.

Rex (E. G.). **A promising fungous pathogen of adult Japanese Beetles (Popillia japonica).**—*J. N.Y. ent. Soc.*, xlviii, 4, pp. 401–403, 1940. [Abs. in *Rev. appl. Ent.*, Ser. A, xxix, 7, p. 368, 1941.]

When adults of *Popillia japonica* Newm., were dusted with the spores of *Beauveria bassiana* isolated from larvae of *Leptinotarsa decemlineata* Say [*R.A.M.*, xviii, p. 591], the percentage of infection in many cases reached 100 per cent. About 75 per cent. of adults allowed to feed on leaves sprayed with a dilute aqueous suspension of the spores became infected, as did 20 to 70 per cent. of healthy adults kept in close association with others previously exposed to infection. From this and similar evidence it is concluded that the fungus shows considerable promise as a means of controlling adults of *P. japonica*.

Drechsler (C.). **Four Phycomycetes destructive to nematodes and rhizopods.**—*Mycologia*, xxxiii, 3, pp. 248–269, 5 figs., 1941.

A new genus, *Cystopage*, is established for two new species belonging in the Zoöpagaceae, described as *C. lateralis* (capturing various nematodes) and *C. subtilis* (capturing rhizopods), respectively [*R.A.M.*, xix, p. 703]. Both species were found occurring in leaf mould in Wisconsin. Two amoeba-destroying species, *Acaulopage stenospora* and *Cochlonema symplocum*, are described from Virginia and Wisconsin, respectively.

Muskatblit (E.). **Allergic manifestations of fungous diseases.**—*Med. Rec., N.Y.*, clii, 8, pp. 273–277; 9, pp. 314–317, 1940.

'Mycids' (defined as allergic manifestations produced by the action of fungi or their products on tissue made hypersensitive by a preceding fungal infection) have been found, in the author's New York practice, to be due mostly to *Epidermophyton* spp., notably *E.* [*Trichophyton*] *interdigitale*, *T. gypseum*, *T. faviforme*, *T. acuminatum*, *T. crateriforme*, *Microsporon lanosum* [*M. felineum*] (predominating in cases of tinea capitis), *M. audouini*, *Achorion schoenleini*, and *Monilia* [*Candida*]

albicans. The antigen, consisting of the organized fungal elements or toxins, is conveyed from the site of infection to the more remote parts of the skin by way of the blood stream, from which the pathogen may occasionally be isolated. Persons suffering from mycids almost invariably react positively to trichophytin injections.

Sharp (W. B.). **Extraction of antigen from molds.**—*J. invest. Derm.*, iv, 3, pp. 205–217, 1941.

The procedure adopted by the writer for the extraction of antigen from *Microsporon felineum* and *M. audouini* at the University of Texas Medical School was based on the dissolution of proteins from Sabouraud's broth cultures into a sodium chloride solution and salting them out with ammonium sulphate. The residue contains the antigen [cf. preceding abstract] capable of effecting immunization against the specific organism in animals. With the aid of these reagents, moreover, serologic groupings among the dermatophytes and related organisms may be established, and the following results were obtained in experiments on rabbits. A close relationship between the two above-mentioned *M.* spp. was apparent from the cross-precipitations of the serum, whereas the connexion between *Trichophyton mentagrophytes* and *T. rubrum* and the agents of microsporosis was much more distant, *T. epilans*, *M.* [*T.*] *gypseum*, and *E. floccosum* were barely, if at all, related to *M. felineum* and *M. audouini*, while no affinity whatever could be demonstrated between the two last-named fungi and saprophytes of the genera *Aspergillus*, *Penicillium*, *Hormodendrum*, *Fusarium*, and *Alternaria*.

Burt (K. L.) & Ketchum (Helen M.). **The classification of strains of Candida (Monilia) isolated from sputum.**—*Amer. J. trop. Med.*, xxi, 3, pp. 427–446, 1941.

From the sputa of 693 patients at the Michigan State Sanatorium the writers isolated 250 strains of *Candida* (36 per cent.), of which 205 (82 per cent.) were classified as *C. albicans*, 40 (16 per cent.) as *C. tropicalis*, 2 (0·8 per cent.) as *C. krusei*, while 3 (1·2 per cent.) remain unidentified. Of 15 strains received from Martin and Stovall, 3 were referred to each of the species *C. parakrusei*, *C. albicans*, and *C. tropicalis*, and 2 each to *C. krusei*, *C. stellatoidea*, and *C. pseudotropicalis* [*R.A.M.*, xx, p. 258]. Most of the strains were readily determined by the inoculation of malt agar plates and modified Durham tubes containing sucrose and maltose at 37° C. Fermentation tests were also used with predominantly consistent results, and intensive studies were made of the mycelial habits and giant colonies of the various species for differential purposes.

Joachim (H.) & Polayes (S. H.). **Subacute endocarditis and systemic mycosis (Monilia).**—*J. Amer. med. Ass.*, cxv, 3, pp. 205–208, 7 figs., 1940.

A detailed account is given of the clinical aspects of a fatal case, believed to be exceedingly rare or unique, of subacute endocarditis and systemic mycosis in a 48-year-old male at Brooklyn, New York. The organism isolated from granulomata in the epidermal and subcutaneous

tissues agreed in cultural and morphological characters with *Monilia* [*Candida*] *psilosis*, but as the patient's serum reacted positively to authentic cultures of *M.* [*C.*] *albicans* the final identification of the pathogen awaits further study.

Weidman (F. D.) & Rosenthal (L. H.). **Chromoblastomycosis : a new and important blastomycosis in North America ; report of a case in Philadelphia.**—*Arch. Derm. Syph., Chicago*, xliii, 1, pp. 62–84, 4 figs., 1 map, 1941.

The fifth case of chromoblastomycosis for the continental United States is reported, occurring in a 44-year-old negress at Philadelphia. The causal organism was identified as *Hormodendrum pedrosoi* [*R.A.M.*, xx, p. 202]. The authors were unable to detect any *Phialophora* cups in their cultures of the fungus, but a few were detected by Carrión (personal communication) in cultures sent to him for examination. This record brings the known total of cases (nearly all in men) to 110 (41 in North America, including Cuba, Puerto Rico, San Domingo, Guatemala, and Costa Rica), 58 in South America, three in Europe (U.S.S.R.), two in Africa (one each in Rhodesia and Algeria), and six in Asia (three each in Japan and Dutch East Indies). The various fungi claimed to be causative in the disease possess the common property of appearing in the human skin as characteristic large, brown, sclerotic cells, so conspicuous and distinctive as to afford a ready means of microscopic diagnosis. A new feature in the authors' case was an 'encrusting' mantle round the fungus cells which stained pink in sectors.

Kessel (J. F.). **Recent observations on Coccidioides infection.**—*Amer. J. trop. Med.*, xxi, 3, pp. 447–453, 1941.

This paper, read at the 36th Annual Meeting of the American Society of Tropical Medicine, held at Louisville, Kentucky, in November, 1940, embodies some outstanding recent observations, of predominantly clinical interest, on the two types of infection caused by *Coccidioides immitis* in California, namely, the benign 'San Joaquin Valley fever' and the much graver coccidioidal granuloma [*R.A.M.*, xx, p. 203], the death rate from the former being estimated at less than 1 and from the latter at 50 to 60 per cent.

Mallmann (W. L.) & Michael (Catherine E.). **The development of mold on cold storage Eggs and methods of control.**—*Tech. Bull. Mich. agric. Exp. Sta.* 174, 33 pp., 1 graph, 1940.

Representatives of ten genera of fungi were repeatedly isolated from eggs obtained during two seasons from cold storage plants and examined at the Michigan Agricultural Experiment Station, but species of only two—*Penicillium* [*R.A.M.*, xviii, p. 180] and *Hormodendrum*—were isolated from the interior of the shell, the *P.* species involved being *P. citro-roseum*, *P. asperulum*, *P. chloroleucon*, *P. ochrochloron*, *P. oxalicum*, *P. puberulum*, *P. citrinum*, *P. janthinellum*, *P. casei*, *P. crustosum*, *P. flavo-glaucum*, *P. viridicatum*, *P. verrucosum*, *P. roqueforti*, and *P. kapuscinskii*. A number of these were isolated from new and mouldy egg cases, which also bore *Chaetomium globosum*. The last-named and *Mucor racemosus* were also isolated from the boards of new cases. The

outer surface of the mouldy eggs yielded, in addition to the above-mentioned *P.* spp., *Aspergillus flavus*, *A. niger*, *Fusarium* sp., *M. racemosus*, *M. lausannensis*, *C. globosum*, and *Cephalosporium* sp.

Two groups of compounds were tested for their value as mycostatic agents in the control of egg moulds, comprising (1) those with little or no vapour tension, acting by contact with the mould spores or mycelium, and (2) those with a vapour pressure sufficient to convey the inhibitory action to the mould without direct contact. The antiseptics of the latter group proved to be most effective, notably sodium 2, 4, 5 trichlorophenate (dowicide B), sodium 2, 4, 5, 6 tetrachlorophenate (dowicide F), and sodium pentachlorophenate (dowicide G) [ibid., xix, pp. 289, 574], of which the first-named exerted the most powerfully fungicidal action but the last-named is recommended as the most satisfactory of the three preparations under ordinary commercial conditions, being superior from the standpoint of economy, slight odour, and a relatively low vapour pressure. Impregnation of fillers, flats, and cases was found to be the best method of applying the mycostat, which did not impair the odour or taste of the eggs stored therein.

Ikata (S.) & Yoshida (M.). **A new anthracnose of Jute Plant.**—*Ann. phytopath. Soc. Japan*, x, 2–3, pp. 141–149, 6 figs., 1940. [Japanese, with English summary.]

Colletotrichum corchorum Ikata & Tanaka n.sp. [without a Latin diagnosis] forms on jute (*Corchoris capsularis*) stems, leaves, and pods in the Kumamoto, Shizuoka, and Aichi Prefectures of Japan, brown to black, sharply defined lesions, and is characterized by a patelliform stroma, 100 to 350 μ in diameter and 25 to 50 μ in height, from the margin of which arise varying numbers of yellowish-brown to black, 2- to 5-septate setae, 36 to 117 by 3·6 to 5 μ; simple, hyaline, conidiophores, 15 to 35 by 3 to 4 μ; aud abundant non-septate, hyaline curved, bluntly tapering, oblong-fusoid to falcate-fusoid conidia, 12 to 25 by 3·6 to 6 (average 16 to 22 by 4) μ. The optimum temperature for the growth of the fungus is 30° C. Its pathogenicity was demonstrated by inoculation experiments, the incubation period being about three days. *Colletotrichum corchorum* is a seed-borne parasite, the mycelium originating in the seed to the exterior of which the spores adhere.

Celino (M. S.) & Ocfemia (G. O.). **Two additional insect vectors of mosaic of Abacá, or Manila Hemp plant, and transmission of its virus to Corn.**—*Philipp. Agric.*, xxx, 1, pp. 70–79, 1 pl., 1941.

Aphis gossypii and *Rhopalosiphum nymphaeae* have already been shown by the first-named writer to be instrumental in the transmission of abacá [*Musa textilis*] mosaic in the Philippines [*R.A.M.*, xx, p. 65], and further experiments have demonstrated the agency of *Aphis maidis* from maize and *R.* (near *prunifoliae*) from *Paspalum conjugatum*, *Cynodon dactylon*, and other grasses in the conveyance of the disease from infected to healthy abacá plants, the incubation periods ranging from 8 to 15 days with *A. maidis* and from 7 to 15 with *R.* (near *prunifoliae*). *A. maidis* further transmitted the abacá virus to maize, the incubation period ranging from 4 to 13 days. The virus was recovered from the latter plant by the aphids and found to be still infectious to maize and abacá seedlings. The writers are of opinion that the trans-

missibility of abacá mosaic to maize denotes an affinity between this virus and that of cucumber mosaic.

Colhoun (J.) & Muskett (A. E.). **Powdery mildew, hail damage and heat canker of Flax.**—*Gdnrs' Chron.*, Ser. 3, cx, 2848, p. 30, 1 fig., 1941.

The fungus observed on flax plants showing the symptoms of powdery mildew in Northern Ireland in 1939 and 1940 was characterized by conidia measuring 35 by 14 μ, borne singly or in short chains on the tips of conidiophores, and agreeing with Salmon and Ware's description of the imperfect stage of *Erysiphe polygoni*, found on the same host in the greenhouse at Cambridge in 1927 [*R.A.M.*, vi, p. 727], the present record being the first of the occurrence of the disease in the field in Great Britain. In the absence of the perithecial stage the exact identity of the fungus cannot be established, but the available evidence is considered to point to *E. polygoni* as the responsible agent, rather than *E. cichoracearum*, to which the mildew has also been referred by various authorities [ibid., xiii, p. 515].

Heat canker of flax, recently reported from Co. Donegal [ibid., xx, p. 62], was observed in June, 1939, in a few crops in Co. Tyrone.

Gregory (P. H.). **Studies on Sclerotinia and Botrytis. I.**—*Trans. Brit. mycol. Soc.*, xxv, 1, pp. 26–40, 3 pl., 1 graph, 1941.

By exposing to the weather material infected with sclerotia of *Botrytis* spp., preferably on sand at the bottom of 10-in. flower pots plugged at the base with glass wool and covered with cheesecloth, apothecia were secured from *B. polyblastis* [*R.A.M.*, xviii, p. 32] in all 14 pots used; from *B. narcissicola* [ibid., xix, p. 539] in 7 out of 8; from *B. cinerea* on dicotyledonous hosts in 1 out of 11, and on monocotyledonous hosts in 2 out of 19; and from a new form of *Botrytis* on *Allium triquetrum* in one pot exposed. One pot full of leaves of Golden Spur narcissus bearing sclerotia of *B. narcissicola* gave three types of apothecia, two apothecia found proving to be the perfect stage of *B. cinerea*. Sclerotia bearing single young apothecia were then placed on moist filter paper in sterile Petri dishes, and the ejected ascospores caught on a film of plain agar on a cover-glass. Single ascospores were picked off the deposit and transferred to hanging drops of sterile agar. The production of the conidial stage established its genetic connexion with the *Sclerotinia* from which it was derived.

Field studies showed that the life-cycle of *S. polyblastis* is as follows. At the close of winter, the sclerotia produce apothecia at about the time when *Narcissus tazetta* and *N. pseudonarcissus* are in flower. The ascospores infect the perianth and may set up flower-spotting, but the leaf tissue remains as yet resistant. The fungus continues to live on withered flowers, and produces enormous numbers of conidia, which set up epidemic infection on the maturing foliage. On the leaves conidia are produced somewhat sparsely, and these probably serve to spread infection. Later the leaves produce numerous sclerotia. Two steps that should do much to prevent epidemics are (1) to remove and destroy all withered narcissus leaves in summer, and (2) to remove all flowers from the field to break the cycle between sclerotium and leaf infection.

Apothecia on aestivated sclerotia of *B. narcissicola* on narcissus leaves were demonstrated to be the perfect stage of the fungus, which is named *S. narcissicola* n.sp. [with a Latin diagnosis]. The fungus is characterized by black, smooth, globose sclerotia, 1 to 1·5 mm. in diameter. The apothecia, which arise singly from the sclerotia, are cup-, later funnel-shaped, with a flat disk, warm sepia to raw umber when mature, and up to 2·5 mm. in diameter. The raw umber stipe is 1·5 to 5 mm. or more long. The under side of the cup and the stipe are covered with minute, white to brownish scales. The asci measure 120 to 140 by 8 μ, and the indistinctly biguttulate, naviculate ascospores 10 to 20 by 5 to 9 (mean 15·4 by 7·1) μ.

In April, 1937, a *Botrytis* was found on *A. triquetrum* in the Isles of Scilly. In May, 1939, infected leaves bearing sclerotia were placed on sand in a pot at Newton Abbot, and on two occasions subsequently apothecia were found growing from the sclerotia. The genetic connexion between the conidia and apothecia was established when young cultures from single ascospores produced the spherical conidia over the surface of mycelium and sclerotia. The fungus, which is named *S. sphaerosperma* n.sp. [with a Latin diagnosis], is characterized by black, ovate-spheroidal sclerotia measuring 1·5 to 2·5 by 0·5 to 1 mm. The warm sepia, cup-shaped, later discoid, flat apothecia, of which one or two arise from each sclerotium, measure 1 to 1·5 mm. in diameter by 0·3 mm. thick. The isodiametric stipe is dark at the base and 1·5 to 33 mm. long. The asci measure 240 by 14 to 15 μ, and the naviculate ascospores measure 17 to 26 by 8 to 12 μ. The conidial stage is of the *Botrytis* type, with conidiophores measuring 160 to 700 by 7 to 20 μ, rarely branched; the conidia, arranged in compact heads, usually in a single whorl, hyaline, spherical, germinating by means of one to four germ-tubes, measure (from living leaves) 20 to 28 μ in diameter.

Taylor (R. E.). **A wilt disease of Godetias and other ornamental plants.**—*Ann. appl. Biol.*, xxviii, 2, pp. 91–101, 1 pl., 1941.

In 1936 a pycnidial fungus was found at Cambridge on the stem of wilted *Godetia* plants and subsequently a similar disease was observed on *Centaurea moschata*, *Clarkia elegans*, and antirrhinum [*Antirrhinum majus*]. On all these, typical symptoms included browning (blackening in *Centaurea moschata*) of the stem, chiefly in the lower parts, the extension of the lesion, and stem encirclement, the plants subsequently wilting. Infection commonly centres round the nodes near soil-level, but parts some distance from the ground are occasionally attacked. Abundant pycnidia later develop on the dead shoots.

Inoculations through wounds on *Godetia* and *Clarkia elegans* stems with isolates G (isolated from pycnidia on *Godetia* in 1936), GX (from the same in 1939), Cl (from pycnidia on *C. elegans*), SS (from pycnidia on *Centaurea moschata*), and AI (from wilting shoots of antirrhinum) resulted in typical symptoms. *C. moschata* plants inoculated with these fungi showed blackening of the stem, but the progress of the disease was similar. Further inoculations of wounded stems showed that GX, SS, and AI were strongly pathogenic to antirrhinum, while G and Cl appeared unable to attack it. With scabious [*Scabiosa*] only GX and Cl became established, the effect on the plants being serious only after

a considerable time. *C. cyanus* was susceptible to SS (but not to G or AI), and *Oenothera biennis* to SS.

All five isolates were pycnidial fungi, with hyaline, cylindrical spores with rounded ends, measuring approximately 6 to 9 by 2·5 to 3·5 μ, 5 to 40 per cent. being uniseptate and the remainder aseptate, though occasional biseptate spores were observed. The cultural characters of the fungi isolated were compared, and found to be closely similar when first obtained from their respective hosts. They are considered to be separate strains of a single species provisionally determined as *Diplodina passerinii* [*R.A.M.*, v, p. 165] differing slightly in cultural behaviour and pathogenicity.

McCulloch (Lucia) & Weigel (C. A.). **Gladiolus diseases and insects.** —*Fmrs' Bull. U.S. Dep. Agric.* 1860, 18 pp., 9 figs., 1941.

Popular notes are given on the symptoms and causes of a number of diseases of gladiolus in the United States, with general directions for their control, including hard rot (*Septoria gladioli*) [*R.A.M.*, xiii, p. 380], scab and leaf blight, or neck rot (*Bacterium marginatum*) [ibid., xix, p. 22], dry rot (*Sclerotinia gladioli*) [ibid., xiii, p. 581], rot due to *Penicillium gladioli* [ibid., xx, p. 364], *Fusarium* rot (*F. oxysporum* var. *gladioli*) [ibid., xix, p. 582], vascular disease or yellows due to a species of *Fusarium*, mosaic [ibid., ix, p. 628; xviii, p. 784], leaf spot (*Botrytis* [? *cinerea*: ibid., xix, p. 539]), and leaf blight (*Bact. gummisudans*) [ibid., xvi, p. 180].

The most serious of these diseases at the present time is probably the *Fusarium* vascular disease or yellows. In the field the plants turn pale or yellow. The corm shows a brown rot beginning at the basal scar, passing upwards into the core, and outwards to the leaf bases. Many plants succumb, and the corms decay in the ground. When infection is less severe, the plants may mature and produce new, apparently normal corms. The disease increases during storage, and in the spring many stored, infected corms show brown spots along the nodes, or are entirely spotted. Others may appear to be healthy, but if planted, may rot or produce sickly plants, while the new corms will probably be infected. Control consists in the elimination of diseased stock, planting in well-drained soil, and storage under dry, cold conditions. Affected fields should not be planted to gladioli for some years.

Varieties with easily injured corms are very susceptible to *P. gladioli* and should be kept at 80° to 90° F. for a week or more immediately after being dug.

Tasugi (H.) & Siino (H.). **Damping-off of seedlings of China Aster and Zinnia.**—*Ann. phytopath. Soc. Japan*, x, 2–3, pp. 278–293, 4 figs., 2 graphs, 1940. [Japanese, with English summary.]

Pythium megalacanthum var. *callistephi* n. var., the agent of a brown, water-soaked rot of China aster (*Callistephus chinensis*) seedlings, resulting in damping-off, differs from *P. megalacanthum* proper in the production of conidia, absence of sporangia, and oospore dimensions. It is characterized by hyaline, spherical, ordinarily terminal, rarely intercalary conidia, 23·1 to 44·4 (average 34·5) μ in diameter; terminal, hyaline, spherical oogonia, 32·4 to 50·9 (41·6) μ in diameter, usually

covered with spines, 5·6 to 8·3 by 2·8 to 4·6 μ; terminal or intercalary, hyaline, reniform antheridia, 11·1 to 21·3 by 8·3 to 17·6 (15·7 by 12·6) μ, generally one, rarely two, per oogonium; and spherical oospores, almost filling the oogonium, 22·2 to 39·8 (33·1) μ in diameter, with pale yellowish-brown, smooth walls, 0·9 to 2·8 μ in thickness.

Good growth is made on oatmeal and potato agars over a range from 10° to 29° C., with an optimum at 23°, the most favourable hydrogen-ion concentration lying between P_H 5·8 and 6·9. Inoculation experiments on *C. chinensis*, lettuce, and *Papaver rhoeas* resulted in typical damping-off, *Zinnia elegans* being somewhat less susceptible, *Calendula officinalis* and *Antirrhinum majus* resistant, and tomatoes merely developing a brown discoloration of the roots.

A strain of *Pythium spinosum* [*R.A.M.*, xvii, p. 246], presenting certain anomalies in respect of pathogenicity and conidial dimensions, causes damping-off of *Z. elegans* and in inoculation experiments severely attacked its own host, *Callistephus chinensis*, cabbage, lettuce, *A. majus*, *Calendula officinalis*, and *Papaver rhoeas*, while cucumber, tomato, and eggplant contracted mild infection. Potato and bean agars were the most suitable media for the growth of the fungus, the minimum, optimum, and maximum temperatures for its development being 8°, 24°, and 35°, and the optimum hydrogen-ion concentration between P_H 5·8 and 6·5.

Ark (P. A.) & Tompkins (C. M.). **The boron-deficiency disease of Gloxinia and its control.**—*Phytopathology*, xxxi, 5, pp. 467–469, 1 fig., 1941.

During the last three years, *Sinningia speciosa* growing in commercial glasshouses in the vicinity of San Francisco Bay and near Santa Cruz have been affected by a serious disease, attacking small to large seedlings in flats and transplanted seedlings in pots, and occasioning losses frequently ranging from 50 to 75 per cent. of the crop.

On young seedlings small, brownish-black, non-necrotic, irregular areas appear at or near the base of the leaf lamina. Discoloration spreads in a few days towards the tip of the leaf and down into the crown of the plant, the leaves showing conspicuous loss of turgidity. The growing point is often killed prematurely. On older, affected plants in pots, the flowers and peduncles are greatly reduced in size, and appear to be wilted; the aerial parts become necrotic, then death ensues.

No organism was associated with the condition. The plants were growing in a natural compost of forest soil, twigs, debris, and rat excrement, known as 'ratsnest', and experimental evidence showed that this medium was deficient in boron. The condition was controlled by several applications of a 6 per cent. solution of boric acid applied fortnightly.

A similar disease observed on *Calceolaria herbeo-hybrida* was also controlled by the same treatment.

Bond (T. E. T.). **A leaf spot disease of annual Phlox.**—*Trop. Agriculturist*, xcvi, 3, pp. 142–146, 1 pl., 1941.

In February, 1941, *Phlox drummondii* plants growing in Ceylon were

severely attacked by a leaf spot found to be due to a species of *Septoria* with pale brown, immersed pycnidia, 55 to 160 (mean 103·4) μ in diameter, and hyaline, filiform or acicular, straight, slightly curved, or bent spores, showing up to 3 septa, 17 to 66·5 (43·3) by 1·5 to 3 (2·1) μ. The fungus is regarded as agreeing more closely with *S. drummondii* [*R.A.M.*, xix, p. 197] than with *S. phlogis* Sacc. & Speg. [ibid., xvii, p. 654] or *S. divaricatae* Ell. & Ev. (= *S. phlogis* Ell. & Ev. non Sacc. & Speg.), and the first name is provisionally adopted for it, though the distinctions between the three species may be purely hypothetical. Control is recommended by garden hygiene and (if necessary) fortnightly applications of sulphur dust or Bordeaux mixture. This is the first record for the fungus in Ceylon.

Akai (S.). **On the pathological histology of the deformed petioles and leaves of Camellia japonica caused by an undetermined species of Exobasidium.**—*Ann. phytopath. Soc. Japan*, x, 2–3, pp. 105–109, 4 figs., 1940. [Japanese, with English summary.]

In the neighbourhood of Kyoto the young foliage and sometimes the young green stems of *Camellia japonica* are attacked by *Exobasidium camelliae* [*R.A.M.*, xix, p. 413] var. *nudo*, which produces circular spots resembling those of blister blight (*E. vexans*) on tea. The cells of the affected organs undergo hypertrophy but no hyperplasia. The exogenous hymenium of the pathogen originates below the epidermal cells or in the intercellular spaces of one to three subepidermal layers, which subsequently rupture and expose the hymenium.

Ogawa (T.). **Preliminary report on the leaf spot disease of Camellias caused by Graphiothecium kusanoi sp. nov.**—*Ann. phytopath. Soc. Japan*, x, 2–3, pp. 269–277, 7 figs., 1940. [Japanese, with English summary.]

Graphiothecium kusanoi n.sp., which forms greenish-white, circular spots, 2 to 4 mm. in diameter, with black, 'snake eye' centres, on the upper leaf surfaces of *Camellia japonica* var. *spontanea* in the Tokyo Imperial University Forest, is described [with a Latin diagnosis] as provided with hypophyllous, erumpent stromata, with pitch-black, conical protuberances, 1 mm. in diameter and 0·5 mm. in height, whence arise persistent, simple, pitch-black synnemata (1 to 30 per stroma), 850 by 70 μ, those developing from the apices of the mature ones being straight, slender, and pale-coloured; hyaline, bifurcate or penicillate conidiophores, and ovoid or ellipsoid, concatenate, hyaline conidia, 6 to 10·6 by 3·5 to 4·5 μ. The pathogen gains ingress to the leaf through the stomata on the under surface, forming its stroma in the respiratory cavity. The invaded tissues decay and turn brown, while the surrounding cells undergo division.

Hidaka (Z.). **Note on a new spotted Bamboo 'Yôraku-montiku' caused by Lembosia tikusiensis n.sp.**—*Ann. phytopath. Soc. Japan*, x, 2–3, pp. 150–153, 2 pl., 1940. [Japanese summary.]

Lembosia tikusiensis n.sp. is the name applied to a fungus producing a very ornamental pattern, in the shape of light to dark brown, concentrically zonate, elliptical spots, 12 by 6 mm., usually between the

hird and tenth aerial nodes, on bamboo (*Phyllostachys nigra* var. *henonis*) near Hukuoka and in other regions of Japan, where they are highly prized commercially for sale as souvenirs. The culms chiefly affected are those in a state of debility through overcrowding, lack of sunshine, excessive humidity, or other adverse environmental factors. The fungus is described [with a Latin diagnosis] as characterized by a superficial, brown, branching mycelium, 2·5 to 3 μ in diameter; brown, circular or irregular hyphopodia, 14 to 26 μ in diameter; elongated, sometimes radiating, blackish-brown perithecia, 153 to 1,064 by 82 to 216 μ, with linear fissures or ostioles; and ovoid or pyriform asci, 32 to 44 by 16 to 19 μ, containing eight light brown, oblong to ovoid, uniseptate, smooth spores, 16 to 18 by 7 to 9 μ, and accompanied by numerous filiform, hyaline paraphyses, 44 μ in length, swelling towards the apices.

Sampson (Kathleen) & Western (J. H.). **Diseases of British grasses and herbage legumes.**—vii+85 pp., 8 pl., 15 figs., Cambridge University Press, 1941. 5*s*.

This fully documented and clearly illustrated monograph on the diseases of British grasses and herbage legumes (to which a foreword is contributed by Sir George Stapledon) is a most valuable contribution to phytopathological literature, embodying the results of the investigations at the Welsh Plant Breeding Station, Aberystwyth, during the past 20 years. The main purpose of the compilation is to present in an accessible form information on the fungal and other diseases of the crops originally appearing in scattered periodicals, while an attempt has also been made to assess the relative importance of the various parasites discussed in the light of regional surveys. A 13-page bibliography is appended. The monograph is issued for the authors by the British Mycological Society.

Jacques (W. A.). **Crested Dogstail (Cynosurus cristatus), its character and behaviour under New Zealand conditions.**—*N.Z. J. Sci. Tech.*, A, xxii, 3, pp. 128–145, 2 figs., 1 graph, 1940.

Crested dogstail (*Cynosurus cristatus*) is subject to two fungal diseases in New Zealand, one an unidentified smut of rare occurrence and (at present) no economic importance, and a species of *Helminthosporium* causing the formation on the leaves, leaf sheaths, flowering stems, and glumes of dark brown, circular or elliptical spots, the centres of which subsequently turn greyish and assume a parchment-like texture. The basal stems of the older tillers of affected plants are also liable to contract infection, and the high mortality from the disease during the summer is probably attributable to this source. In May, 1939, 370 out of 920 spaced plants set out as clones a year earlier were dead, and considerably under half the survivors showed signs of vigorous recuperation. The early-flowering commercial plants were found to be the more susceptible to the *Helminthosporium* leaf spot than the late Kentish types, the incidence of which in January, 1930, amounted to 76 per cent. in the commercial lines compared with 62 in selections therefrom. In the same year, 65 per cent. of the seeds (over 600) taken at random from infected commercial plants showed the discoloured

areas produced by the fungus on the pales and glumes, but the germinability of the seed did not appear to be impaired.

Muncie (J. H.) & Megee (C. R.). **Alfalfa bacterial wilt in Michigan.**—*Circ. Bull. Mich. agric. Exp. Sta.* 171, 11 pp., 2 figs., 1939. [Received August, 1941.]

Most of the information on bacterial wilt of lucerne (*Phytomonas insidiosa*) [*Aplanobacter insidiosum*] presented in this popular bulletin has already been noticed from the original sources cited, but it may be mentioned that, under local conditions in Michigan, the Ladak variety is comparatively resistant, surviving attacks of the pathogen to which both Grimm and Hardigan succumb. Hardistan and Kaw (probably strains of Turkestan) are also superior to Grimm in respect of wilt resistance, but the seed of these varieties is not available on the market. A limited supply of Ladak seed may be obtained at a price slightly higher than that of Hardigan and Grimm.

The agent of wilt may be carried in surface drainage water and also during the cutting of the crop on the mower knife, which should be disinfected with formaldehyde (1 in 15) before use on a healthy field. Infection has been produced on greenhouse plants by removing the tops with a razor blade dipped in a bacterial suspension, the incubation period in such cases being of seven months' duration.

An elevated site should be selected for the lucerne crop, which will thus escape the surface drainage from infected fields. The spread of wilt in the field appears to be reduced by the intermixture of smooth brome grass [*Bromus inermis*] with the lucerne. Cutting for hay or close grazing should be discontinued after 1st September, owing to the risk of winter injury and consequent facilitation of ingress for the bacterium.

Ross (A. F.). **Purification and properties of Alfalfa-mosaic virus protein.**—*Phytopathology*, xxxi, 5, pp. 394–410, 2 graphs, 1941.

The lucerne mosaic virus [*R.A.M.*, xix, pp. 370, 382, 668], isolated in the form of a nucleoprotein from Holmes's necrotic-type Turkish tobacco plants [ibid., xvii, p. 417] by differential centrifugation at 0° to 4° C. at the Rockefeller Institute for Medical Research, Princeton, New Jersey, is approximately spherical with a specific gravity of 1·48 and a sedimentation constant of 74×10^{-13}, its molecular weight being estimated at $2{\cdot}1 \times 10^6$ and its diameter at 16·5 mμ; it is thus the smallest of the plant viruses so far analysed. The virus, which is transmissible by the pea aphid, *Macrosiphum pisi*, is rapidly inactivated at room temperature but much more stable at 4° C. It is inactivated by sodium sulphite and sodium hydrosulphite, while cysteine has a stabilizing effect on partially but not on wholly purified preparations. Toluene assists in the preservation of the virus.

When lucerne mosaic virus dissolved in 0·1 M phosphate buffer is rubbed on Early Golden Cluster bean (*Phaseolus vulgaris*) leaves, the number of lesions induced is proportional to the virus concentration over a limited range only. At concentrations below 5×10^{-4} gm. per c.c., the number formed as a result of inoculation decreases more

rapidly than does the virus concentration in the inoculum, and at 10^{-5} gm. per c.c., few or no spots develop.

[A more detailed discussion of the physical properties of the lucerne mosaic virus by M. A. Lauffer and A. F. Ross appears in *J. Amer. chem. Soc.*, lxii, pp. 3296–3300, 4 graphs, 1940.]

Ross (A. F.). **The concentration of Alfalfa-mosaic virus in Tobacco plants at different periods of time after inoculation.**—*Phytopathology*, xxxi, 5, pp. 410–420, 2 graphs, 1941.

In young necrotic-type Turkish tobacco plants inoculated with the lucerne mosaic virus [see preceding abstract], the virus content of the host increases from about the fourth to the twelfth day after inoculation, when a rapid decrease sets in, the juice from plants infected for 48 days or longer being in some cases less than 1 per cent. as active as that from plants infected for only 12 days. Even in the faintly mottled upper leaves of older plants, where most of the virus is concentrated, the strength is much less than that attained 12 days after infection. It would appear that tobacco plants inoculated with the lucerne mosaic virus recover in a similar manner to those infected by the ring spot virus [*R.A.M.*, xv, p. 751], though the former virus differs from the latter in being unstable *in vivo*.

The addition of 3 per cent. dipotassium phosphate to ground diseased tobacco plants before expressing the juice more than doubles the quantity of virus extracted. With such juice, dilution at first results in an increased number of lesions on bean leaves, probably due to an inhibitor in the juice. At medium dilutions, the number of lesions produced is inversely proportional to the dilution, but at higher ones as with the purified virus, the reductions in the number of spots are much greater than would correspond to the changes in dilution.

Wormald (H.). **Presidential address. Recent research on diseases of fruit trees and bushes in Britain.**—*Trans. Brit. mycol. Soc.*, xxv, 1, pp. 4–25, 1941.

In his presidential address to the British Mycological Society for 1940 the author reviews in some detail the progress in research on fruit diseases in Britain during the last 30 years.

Smock (R. M.). **Studies with bitter pit of the Apple.**—*Proc. Amer. Soc. hort. Sci.*, xxxviii, p. 7, 1941.

Nitrogen applications made during the growing season to apple trees at a low level of nitrogen nutrition were found to increase susceptibility to bitter pit [*R.A.M.*, xx, p. 104]. Ringing of the limbs after blossoming also increased susceptibility, and both treatments raised the osmotic concentration of the leaves more than that of the fruits. Susceptibility was, however, much reduced by the defoliation of single limbs, which ended leaf-fruit competition for water. Partial pedicel girdling increased susceptibility, increasing the osmotic concentration of the leaves at the expense of fruits. Drastic thinning increased susceptibility, increasing leaf more than fruit osmotic values. Shading of single limbs increased susceptibility. The view is expressed that bitter pit susceptibility is increased by any field or tree treatment that raises

leaf osmotic values at the expense of fruit osmotic values.

Delayed storage hastened the development of bitter pit in stored apples. Storage in controlled atmospheres delayed the onset of bitter pit, but did not reduce the final amount. Waxing the fruit before storage significantly delayed the appearance of bitter pit. High relative humidities in storage materially delayed or checked attack on highly susceptible fruit.

Latimer (L. P.). **Relation of weather to prevalence of internal cork in Apples.**—*Proc. Amer. Soc. hort. Sci.*, xxxviii, pp. 63–69, 6 graphs, 1941.

Observations [which are tabulated] on the effect of weather conditions on the occurrence and prevalence of internal cork of apples [*R.A.M.*, xx, p. 369] in susceptible areas of New Hampshire demonstrated that climatic factors other than spring and summer rainfall have exercised slight if any influence on the prevalence or severity of the condition since 1926. Extended drought in June and July appears to be the one contributing atmospheric factor definitely responsible for the inability of the tree to obtain sufficient boron for perfect fruit development. Where boron deficiency has been reported it appears that the soil can supply boron in adequate amounts only in years of normal or excessive summer rain. The deficiency is readily overcome by applying borax or boric acid, with the result that internal cork is prevented even in dry summers. While drought in June and July appears to be essential for the development of the condition locally, its effect is even more marked when drought continues from the earlier spring months.

Pickett (W. F.) & Birkeland (C. J.). **Common spray materials alter the internal structure of Apple leaves.**—*Proc. Amer. Soc. hort. Sci.*, xxxviii, pp. 158–162, 3 figs., 1941.

In a study of the effect of spray materials on the internal structure of apple leaves carried out in Kansas, 11 two-year-old trees of each of the Wealthy and York varieties in a greenhouse were sprayed after the new leaves began to appear at weekly intervals for nine weeks with a spray composed of 2½ gals. lime-sulphur (33° Beaumé) and 4 lb. lead arsenate in 100 gals., 11 trees of each variety being left unsprayed as controls. In a corresponding field experiment, 5 two-year-old York and Jonathan and 3 two-year-old Wealthy trees were sprayed from 4th May, 1940, at weekly intervals, and a similar number left as controls. The first six applications were the same as those made in the greenhouse test, the next three were of lead arsenate alone (4 lb. per 100 gals.), and the last five consisted of lead arsenate plus 2 per cent. summer oil emulsion. After the final spray in each experiment, representative leaves were collected and prepared for microscopic study, the ratio, R, of the area of the internally exposed surface to that of the externally exposed surface being calculated for each leaf collected by using Turrell's formula (*Amer. J. Bot.*, xxiii, pp. 255–264, 1936).

In the greenhouse test, the R values for the unsprayed and sprayed Wealthy leaves were 13·4 and 10·71, respectively, the corresponding figures for York being 9·44 and 6·88. In the field test the R values

for the unsprayed Wealthy, Jonathan, and York leaves were 15·3, 13·54, and 11·63, respectively, and for the sprayed ones 11·96, 10·26, and 7·71.

It is concluded that the R ratio in greenhouse- and field-grown apples is reduced by repeated applications of certain spray materials; the evidence also indicated that some of the reduction in photosynthetic activity resulting from spraying may be due to the changes induced in the internal structure of the leaves.

Osterwalder (A.). **Lagerschorfähnliche Flecken am Glockenapfel.** [Storage scab-like spots on the Glocken Apple.]—*Schweiz. Z. Obst- u. Weinb.*, l, 11, pp. 252–254, 1 fig., 1941.

Gloeosporium album was isolated in pure culture on gelatine with a little pear juice from black, irregularly lobate spots, 1 to 1·5 by 1 to 1·5 mm. on stored Glocken apples [*R.A.M.*, xix, pp. 226, 479, 690] at Wädenswil, Switzerland. The lesions closely simulated those of scab [*Venturia inaequalis*], except that towards the centre they were smooth instead of rough, felty, or flocculent. Further, the rind and flesh underlying the *G. album* lesions were discoloured for a depth of about 1 mm., whereas the tissues beneath the scab spots were white. Inoculation experiments with *G. album* were successful only through wounds.

Stoll (K.). **Untersuchungen über den Apfelmehltau (Podosphaera leucotricha [Ell. u. Ev.] Salm.).** [Studies on Apple mildew (*Podosphaera leucotricha* [Ell. & Ev.] Salm.).]—*Forschungsdienst*, xi, 1, pp. 59–70, 1 fig., 4 graphs, 1941.

Apple mildew (*Podosphaera leucotricha*) is stated to be prevalent every year in the Rhine Province, Hesse-Nassau, the Saxon Free State, Westphalia, and the Saar Palatinate, infection reaching a climax during the spring and early summer, except in young plantings of growing trees, in which severe attacks may be expected right up to the autumn. Besides apples, *Malus* [*Pyrus*] *baccata*, *M.* [*P.*] *coronaria*, *M.* [*P.*] *ringo* [*R.A.M.*, xviii, p. 507], *M.* [*P.*] *pumila*, pear [ibid., xii, p. 747], and quince [ibid., xviii, p. 295] serve as hosts of the fungus. In this connexion attention is drawn to the discrepancies between statements regarding varietal reaction to apple mildew from different localities, the Ontario variety, for instance, being designated in 42 per cent. of the reports from fruit-growing regions as resistant, in 25 per cent. as moderately susceptible, and in 33 per cent. as highly susceptible (equally so with Landsberg Reinette). It is apparent from such conflicting evidence that very slight differences of habitat, notably those connected with physiographic factors, e.g., exposure and altitude, play an important part in the course of infection [cf. ibid., xii, p. 298].

Studies on the germination of the conidia of *P. leucotricha* designed to amplify the results obtained by Hammarlund in Sweden [ibid., iv, p. 431], Woodward in England [ibid., vi, p. 732], and Berwith in the United States [ibid., xvi, p. 262], were carried out on collodion membranes, the use of which doubled the germination percentage as compared with glass (approximately 20 and 10 per cent., respectively), while a further stimulus was lent to the process by the impregnation

of the membranes with ether, acetone ethyl acetate, ether ethyl acetate, or ethyl acetate alone, the last-named being particularly effective (50 per cent. germination). The optimum temperature for conidial germination was found to lie between 19° and 25° C.; at greenhouse temperatures viability is rapidly lost, but round about 0° it may be maintained for several weeks. Using Janisch's method (*Handb. biol. Arbeitsmeth., Berlin*, v, 10, pp. 87–112, 1933), the writer determined the effect of the gas or vapour layer over the leaf surface on infection, the test plants being exposed to an air current of a velocity of 4 mm. per second, while the controls were maintained in a still atmosphere. In moving air infection took place only at saturation point, conidial germination being inhibited by a 7 per cent. deficit of relative humidity, whereas the leaves in a still atmosphere contracted the disease at relative humidities down to 34 per cent. Artificial field infection is best carried out in the evening or in cloudy weather on shoots protected by parchment bags.

Theoretically it should be possible to group apple varieties in two classes in respect of their reaction to mildew, those capable of withstanding infection of the non-woody axillary organs [axillary buds] being deemed resistant and those lacking this character susceptible. In practice, however, it is necessary to introduce three grades of intermediate reaction, so that five classes had to be established to accommodate the 10,000 one-year-old plants inspected at the Biological Institute, Dahlem, Berlin, in 1938. Among the highly resistant varieties placed in class 1 were the Doucin stocks, which are of particularly vigorous habit, while all clones succumbing to the disease under the favourable conditions (for the host) afforded by the locality may in general be regarded as definitely susceptible and relegated to class 5. The intermediate classes were occupied by varieties showing a propensity to 'pseudo-resistance' or 'escape' characterized by rapid passage through the critical juvenile stage for foliar infection and no doubt largely dependent on nutritional factors [*R.A.M.*, xii, p. 517].

Haller (M. H.) & Lutz (J. M.). **A comparative study of storage at 32° and 36° F. of Apples grown in the Potomac River Valley.**— *Tech. Bull. U.S. Dep. Agric.* 776, 41 pp., 2 graphs, 1941.

This is a comprehensive, tabulated survey of the effects on 13 commercial apple varieties from the Washington, D.C., district of storage at 32° and 36° F. at the Arlington (Virginia) Experiment Farm in 1935, 1936, and 1937 (Jonathan also in 1934).

Among 49 comparable lots of the different varieties at each temperature (20 from 1935, 22 from 1936, and 7 from 1937) showing a minimum of 5 per cent. decay, the average incidence, attributable mainly to black rot (*Sphaeropsis malorum*) [*Physalospora obtusa*] and blue mould (*Penicillium expansum*), but associated in some instances with *Sporotrichum malorum*, *Botrytis* sp., and *Glomerella cingulata*, was 13·6 per cent. at 32° and 19·8 at 36°. The average percentage of rot for all lots was uniformly higher at 36° than at 32°.

Scald tended to appear earlier in fruit stored at 36°, but eventually became equally or more severe in the lots kept at the lower temperature. The average incidence of the trouble in 18 lots examined at the time of removal from storage was 12·5 per cent. at 32° and 21·1 at 36°,

whereas in 43 inspected a week after keeping at 70°, the corresponding figures for the two temperatures were 35·4 and 31·2 per cent., respectively.

Internal breakdown was more prevalent in Arkansas and Stayman Winesap at 36° than at 32°, but the other varieties included in the tests showed no consistent differences in this respect. Bitter pit was severe in Yellow Newtowns at 36°.

On the basis of these data and those obtained by other workers, the proposal of Plagge *et al.* [*R.A.M.*, ix, p. 39; xiv, p. 592] to change the standard temperature of storage, as recommended by the United States Department of Agriculture [ibid., vi, p. 492], from 32° to 35° or 36° cannot be endorsed.

Apple sooty-blotch and fly speck.—*Indian Fmg*, i, 9, pp. 440–441, 1940.

Good control of sooty blotch [unspecified] and fly speck [? *Leptothyrium pomi*] of apples has been obtained at the Government Fruit Station, Chaubattia, United Provinces, by four applications of 1 in 40 lime-sulphur, 32° Beaumé, sp. gr. 1·283, (1) and (2) at the open-cluster and petal fall stages, respectively, (3) at fruit formation, and (4) when the fruits reach maturity. Thinning the fruits so as to leave two apples per cu. ft. of tree space also assists in the reduction of infection. A simpler method of disinfection consists in one minute's immersion of the picked fruits either in 5 per cent. bleaching powder or 3 per cent. sodium chlorate, followed by ten minutes' exposure to the air, washing in tap water, and wiping with a cloth to remove the disfiguring blemishes.

Kawamura (E.). **Studies on Gymnosporangium haraeanum Syd. I. Heterothallism in the fungus.**—*Ann. phytopath. Soc. Japan*, x, 2–3, pp. 84–92, 3 figs., 1940. [Japanese, with English summary.]

In the later stages of the Japanese pear [*Pyrus serotina*] rust caused by *Gymnosporangium haraeanum*, the alternate hosts of which in Japan are *Juniperus chinensis* and its var. *procumbens* [*R.A.M.*, xvi, p. 411], natural infections completely devoid of aecidia have been not infrequently observed. A study of the sexual behaviour of the fungus designed to elucidate this phenomenon was initiated by the sparse sowing of sporidia on pear leaves. Each infection gave rise to spermogonia, from which spermatia-containing nectar was exuded. At the end of 11 weeks, most of the infections left in an isolated condition remained sterile, whereas aecidia developed within 16 days from the majority of those fertilized by spermatia from the other infections, aecidiospores subsequently appearing in due course. Natural mixtures of nectar in coalescent infections for the most part produced aecidia, which did not arise, on the other hand, from spermogonial nectar denuded of the spermatia by filtration. The spermatia of the rust thus serve to provide the mycelium of monosporidial infections with the opposite sex element, denoting the existence of heterothallism *sensu lato*.

Boynton (D.), Reuther (W.), & Cain (J. C.). **Leaf analysis and apparent response to potassium in some Prune and Apple orchards. Preliminary report.**—*Proc. Amer. Soc. hort. Sci.*, xxxviii, pp. 17–20, 2 figs., 1941.

During studies on the potassium level of fruit trees growing on some

important New York orchard soils, instances of leaf scorch were noted which were associated with a very low potassium content of the foliage.

On affected Italian prunes the leaves appeared normal in spring and early summer. By the middle of July, the leaves on some peripheral branches began to lose their normal green colour, generally fading at the margins first. As the chlorosis progressed, the margins of the older shoot leaves rolled inwards towards the upper surface. Lastly, marginal necrosis developed. On trees severely affected nearly all the leaves sometimes showed a progressive development of these symptoms, while on those moderately attacked, only the older leaves on peripheral branches developed all stages of the symptoms. Where the condition was slight, the symptoms developed late, on outer branches only, and in some cases did not develop beyond the leaf roll stage. The cumulative effects of severe scorch on Italian prunes were reduced terminal growth, retarded fruiting of young trees, and conspicuous dwarfing. In an orchard on apparently uniform soil there were sometimes marked differences in degree of scorching between the trees.

On apples the general symptoms were the same. The leaves of Rhode Island Greening, however, tended to fold at the midrib towards the upper surface rather than to roll. McIntosh leaves did not fold or roll until severe marginal necrosis had developed, while the midribs of affected McIntosh leaves appeared more reflexed than is normally the case.

Tests of response of affected trees to potassium fertilization resulted in the complete disappearance of symptoms on one group of trees which received a heavy mulch of manure in 1939 and 3 lb. potassium fertilizer annually and a reduction in other cases; the partial failure may be due to a lag in the effectiveness of the potash.

ZELLER (S. M.) & EVANS (A. W.). **Vein clearing, a transmissible disease of Prunus.**—*Phytopathology*, xxxi, 5, pp. 463–467, 1 pl., 1941.

Sweet cherries of the Bing, Black Republican, and Lambert varieties, Italian prunes, and *Prunus serrulata* in Oregon were observed in 1936 to be affected by a new virus disease termed vein-clearing, specimens of which on *Prunus* [unspecified] were also received from one district of Washington.

The first symptoms appear on the leaves, the veins of which are uniformly or partially cleared and the margins usually markedly indented. Enations in the form of small, blistered proliferations along the under side of the main veins sometimes develop in the early part of the season. By reflected light a characteristic silvering of the upper leaf surfaces is apparent. At midsummer the affected trees present a somewhat wilted aspect. Shortness of the internodes and a prolific output of buds, spurs, or short branches at the nodes induce a tendency to rosetting, especially at the end of the year-old wood. The fruits of diseased trees may be pointed, flattened on the suture side, and ridged along the suture, but such malformations are practically absent on Black Republican; in the Lambert variety persistent infection involves virtual loss of the fruit crop. Vein-clearing has been shown by preliminary experiments to be graft-transmissible and graft-perpetuated, the incubation period of the virus on Lamberts being about four

months. No insect vector of the disease has been detected, but there are definite indications of natural infection and spread in orchards and nurseries.

The symptoms of vein-clearing are briefly compared with those of mottle leaf [*R.A.M.*, xvi, p. 518], an instance of the apparent predominance of the former over the latter in double infection on a Bing cherry being reported.

The numbers assigned to mottle leaf and vein-clearing are *Prunus* virus 7 and *Prunus* virus 8, respectively [ibid., xvii, p. 52], or following Holmes's classification [ibid., xx, p. 85], the names *Marmor cerasi* and *M. nerviclarens*, respectively.

Hoagland (D. R.). **Water culture experiments on molybdenum and copper deficiencies of fruit trees.**—*Proc. Amer. Soc. hort. Sci.*, xxxviii, pp. 8–12, 3 figs., 1941.

When myrobolan [*Prunus divaricata*] seedlings were grown in nutrient solutions deficient in copper, but containing amounts of it varying from 0 to 0·1 parts per million, deficiency symptoms appeared in all the cultures except in the one containing the greatest amount of the metal. The chief symptom was the dying of the twigs from the tip, this effect resembling, apparently, that described by Oserkowsky and Thomas for pear exanthema in the field [*R.A.M.*, xviii, p. 119]. During the early stages of growth some of the copper-deficient leaves showed a slight purple tint; they turned pale later, but developed no extreme chlorosis. In further tests, the foliage colour was good when 0·2 parts per million of copper were added, but 0·05 parts per million did not give healthy plants. The view taken by Oserkowsky and Thomas, that the exanthema disease studied by them was due to copper deficiency, is supported by these results.

When myrobolan seedlings were grown in nutrient solutions without molybdenum, only one plant of 15 failed to show nutrient deficiency. In the remainder, the leaves were dwarfed, some showed a diffuse mottling, and many developed light brown areas of dead tissue at the tips and margins.

Dickey (R. D.) & Blackmon (G. H.). **A preliminary report on littleleaf of the Peach in Florida—a zinc deficiency.**—*Bull. Fla agric. Exp. Sta.* 344, 19 pp., 8 figs., 1940.

In a 20-acre commercial orchard of Jewel peaches on Norfolk pine sandy soil in Pasco County, Florida, little leaf [*R.A.M.*, xx, p. 214] was effectively combated by the application to the soil of ½, 2, or 5 lb. zinc sulphate per tree, no additional benefit being derived from the addition of magnesium or manganese sulphate, both of which compounds were likewise useless alone. Equally satisfactory results followed the treatment of the foliage with a zinc sulphate-lime spray (5–2½–100), using 1 lb. calcium caseinate as a sticker for the lime, and here again the incorporation of manganese with the zinc, or its independent application, failed to induce any response. In addition to the Jewel variety, Waldo, Angel, and Luttichau peaches also suffer from little leaf, which has been observed over extensive areas of the State.

Cation (D.). **Peach diseases. *ex* Peach culture in Michigan.**—*Circ. Bull. Mich. agric. Exp. Sta.* 177, pp. 69–85, 2 col. pl., 16 figs., 1941.

The writer gives clear descriptions of the symptoms and directions for the control of the fungal, bacterial, and virus diseases of peaches in Michigan, the last-named group including yellows, little peach [see preceding abstract] (both illustrated by excellent coloured plates), red suture [*R.A.M.*, xvi, p. 109], and rosette mosaic [ibid., xx, p. 371].

Evans (A. W.) & Owens (C. E.). **Incidence of Sclerotinia fructicola and S. laxa on Sweet Cherries in Oregon.**—*Phytopathology*, xxxi, 5, pp. 469–471, 1941.

Sclerotinia fructicola was isolated 56 times from blighted sweet cherry blossoms and 39 times from rotted fruits at the Oregon Agricultural Experiment Station in 1940 (72·72 and 51·32 per cent., respectively), the corresponding figures for *S. laxa* being only 21 and 37 (27·28 and 48·68 per cent., respectively). These data are at variance with those reported by Barss in 1923 (*Circ. Ore. agric. Exp. Sta.* 53) and from California in 1939 by Hewitt and Leach [*R.A.M.*, xviii, p. 533], who found *S. laxa* more widespread on stone fruits than *S. fructicola*.

Bhargava (K. S.). **Pythium aphanidermatum (Edson) Fitz. on Carica papaya.**—*Curr. Sci.*, x, 4, pp. 212–213, 1941.

During the rainy season of 1940, papaw trees at Naini, Allahabad, were attacked by an epidemic of stem and foot rot due to *Pythium aphanidermatum* [cf. *R.A.M.*, xviii, p. 781]. Inoculations with the fungus from diseased stems on healthy papaw trees were partly successful, but the patches caused by infection healed up in winter. Inoculations in November and December failed to reproduce the disease, probably owing to the prevailing cool, dry weather.

Department of Agriculture, Mauritius, Proclamation No. 26 of 1941. To prohibit the importation into Mauritius of certain plants.—1 p., 1941. [Mimeographed.]

No living parts, except seeds, of cassava or plants belonging to the genus *Jatropha* may be imported into Mauritius from any country or place (including the Dependencies of Mauritius) without a duly authenticated certificate vouching for the origin of such plants or parts thereof in a district free from cassava mosaic.

The importation into Mauritius from the Union of South Africa of any parts of the *Dahlia* plant, except seeds, is absolutely prohibited [? against tomato spotted wilt: *R.A.M.*, xviii, p. 112].

Bermuda Bye-Laws. Amendment of Bye-Laws made by the Board of Agriculture on 7th March, 1939, regulating the control of plant diseases and pests.—1 p., 1941.

The importation into Bermuda of all parts of *Musa* spp. (bananas and plantains, etc.), including the fruit, is prohibited by an Order of the Board of Agriculture dated 10th June and approved by the Governor in Council 9th July, 1941 [*R.A.M.*, xviii, p. 704].